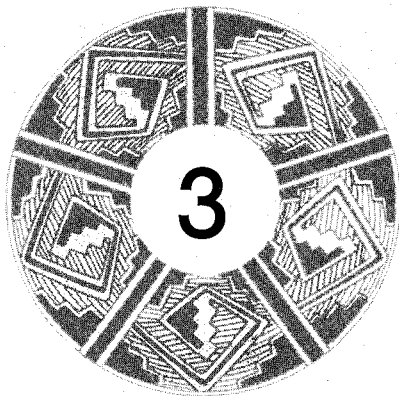




The Use and Misuse of Nineteenth-Century English and American Ceramics in Archaeological Analysis

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"Good morning, Owl," he said.

"Good morning, Pooh," said Owl.

*"Many happy returns of Eeyore's
birthday," said Pooh.*

"Oh, is that what it is?"

"What are you giving him, Owl?"

"What are you giving him, Pooh?"

*"I'm giving him a Useful Pot to Keep
Things In, and I wanted to ask you—"*

*"Is this it?" said Owl, taking it out of
Pooh's paw.*

"Yes, and I wanted to ask you—"

*"Somebody has been keeping honey in it,"
said Owl.*

*"You can keep anything in it," said Pooh
earnestly. "It's Very Useful like that. And I
wanted to ask you—"*

Milne 1926:79

There is a lot of talk here about foreign imports. I was quite surprised to hear the different terms which are used. The department store buyers, for example, call earthenware "semiporcelain" or "chinaware." They call china "porcelain." I have heard all the rest of you

call porcelain "chinaware." There is little interest on the part of the manufacturer, and certainly no help from the buyer, to explain the difference. The American earthenware, which we call semiporcelain, is an absolute misnomer. It has certain advantages from the cost standpoint and has definite inherent beauty in itself. We attempt to compete with this product against a true porcelain, which we call "china," and we do not get down to fundamentals. We do not know what we are talking about.

Gould 1946:376

INTRODUCTION

Ceramic materials from the historical period have long been used by archaeologists for a variety of purposes, from dating the period of a site's occupation or use to understanding the role played by a site's occupants in a wider socioeconomic network. Until recently, the majority of studies of historical ceramics from American sites (1) concentrated on materials that predate the nineteenth century and (2) were centered on sites in the eastern United States, the region of colonization and initial spread of settlement, with less emphasis on sites located west of the Appalachian Mountains. For sites occupied after 1800, especially those located in the Midwest, few detailed studies of historical ceramics were attempted. In the isolated instances in which such studies *were* undertaken, analyses focused on materials from military forts, fur-trading posts, and commercial buildings, which do not necessarily yield the wide range of ceramic materials used in a region after 1800.

With the advent in the 1970s of federally funded cultural resource management, the kinds of sites that up until that point often had been overlooked archaeologically, for example, the small, rural farmstead and the inner-city block house, assumed a new role in American archaeology. State and federal agencies now routinely expend funds to mitigate impending damage to those previously ignored resources, a process that when viewed from a research standpoint would appear to have increased our knowledge both of historical period lifeways and of the factors that shaped those lifeways. It can be argued, however, that many archaeologists are handicapped by a lack of knowledge concerning certain elements of historical archaeology, particularly those involving various aspects of material culture.

Archaeologists working with materials from historical period contexts, regardless of the time period involved, are faced with the problem of meshing information provided by documentary sources with the more traditional classes of information derived from analysis of the archaeological record. Historical archaeologists working in almost any locale of North America must attain a certain level of familiarity with English-made ceramics, because the British dominated the ceramic market until the late 1800s. English pottery and porcelain (grouped here under the term *ceramics*) went through an evolution in

paste and decoration that in theory would make ceramic pieces ideal temporal markers for sorting archaeological assemblages. Many English ceramics also are backmarked, which further elevates their status as time indicators. Beyond this use, English (and later, American) ceramics, as well as documents concerning their manufacture and distribution, are potential sources of valuable information for analyzing and interpreting historical period lifeways. Nonetheless, ceramics constitute one of the most misused categories of artifacts recovered from historical sites.

Our original intention in this chapter was to review the ways in which ceramics have been used in defining patterns in the archaeological record and in interpreting the behavior that resulted in those patterns. We intended to minimize discussion of ceramics *per se*, based on our erroneous belief that adequate discussions existed in the literature and that there was general consensus concerning the characteristics of different ceramic types or classes and what these characteristics implied about the manufacturing processes that produced the ceramics.

Many factors contribute to the confusion surrounding the classification of ceramics, perhaps the primary one being the placement of ceramic materials into typological schemes that are based strictly on the concept of *ware* (e.g., creamware, pearlware, and whiteware). Two problems arise from such an exercise. First, few published sources agree on the definitions of, and criteria for sorting sherds, or vessels, into the ware categories. Without a working knowledge of paste and glaze varieties and an extensive reference collection, the archaeologist must often resort to guesswork when trying to follow a published typological system. Second, groups and types that result from ware-based sorting are archaeological constructs that may have little or nothing in common with how ceramic items were cataloged, marketed, and purchased (cf. Miller 1980).

We became acutely aware of these and other problems as we began analyzing ceramic materials from five northeastern Missouri farmsteads excavated between 1978 and 1980. Many readers probably are at the point we were when we began the project: they know something about ceramic materials found in historical contexts but are not well versed on the subject. We discovered that although there is a wealth of published literature on nineteenth-century ceramics, and less on American-made items of the same period, many reference works treat only the elaborate, "high style" pieces and bypass the "everyday" pieces that were available and affordable to the person of average means (see Noël Hume 1973).

We also discovered that the literature on the archaeology of sites occupied during the nineteenth century contains errors that relate directly to a lack of knowledge of ceramics. Despite the wealth of information that exists on nineteenth-century ceramics, much of which admittedly is located in diverse and often obscure sources, many discussions of archaeological materials tend to include only "pieces" of ceramic histories, which

somehow are then linked to an excavated assemblage. The problem is compounded when one researcher perpetuates inaccuracies by citing secondary sources or, worse, by citing primary sources used in the secondary works without first checking the wording in the primary sources. These problems are more common in the literature than one might suspect.

In an attempt to clear up misconceptions concerning nineteenth-century ceramics, we discuss several topics that should interest archaeologists who have not had much experience in analyzing historical period pottery and porcelain. These include (1) published sources useful for background information; (2) the concept of *ware* and problems in using the concept; (3) how pottery was decorated and the dates for different methods of decoration; and (4) sources for the identification of various backmarks. Our rationale for this extended discussion is that without adequate knowledge of the ceramic materials, that is, knowledge that permits correct identification, analytical results obviously will be seriously flawed. This, as we mentioned, is not an infrequent occurrence in historical archaeology, and it has hampered otherwise well-thought-out studies of time-and-space systematics, studies of formation processes, and at the highest level, studies of human behavior.

There are several temporal and spatial limits to this study. First, we discuss mainly ceramic materials manufactured in Great Britain and the United States between approximately 1800 and 1900, though because these are arbitrary limits that crosscut several important trends in ceramic manufacturing and marketing, we also touch on late eighteenth- and early twentieth-century ceramics. Because of the domination of the ceramic market by England during the nineteenth century, our emphasis is decidedly on English material. Second, we discuss only refined earthenwares and, to a lesser extent, porcelain. Thus we bypass discussion of stoneware, unrefined earthenwares such as redwares, brownware, yellowware, and Native American-manufactured or inspired "colono-ware." Third, our geographic range of interest is mainly the United States east of the Great Plains and portions of eastern and southern Canada.

The chapter is organized around three major topics: (1) the categorization of nineteenth-century ceramics; (2) the temporal placement of ceramic ware groups and, more important, decorative classes; and (3) steps beyond classification and dating, that is, the use of ceramics to identify patterning in the archaeological record, to understand the processes that led to creation of that record, and to examine elements of human behavior deduced from analysis of historical records and elements of the archaeological record.

Attempts to identify cultural patterns in the archaeological record can be hampered by several factors, including misidentification of materials and lack of control over time, site function, and the cultural processes that dictate the need for, and shape the function of, material items within a system.

A more serious flaw is a lack of knowledge about the cultural system of which an archaeological assemblage is a reflection. Understanding the often complex cultural background of the system that produced an assemblage will lead to more tightly reasoned inferences about the behavior that is reflected in the patterning than if induced patterns from one locale are used to "explain" patterning observed elsewhere. We use several studies as case examples of what can be achieved when ceramics are employed as part of a comprehensive analysis of cultural behavior.

In the following section we briefly discuss various options for arranging objects into analytical taxa and then list a variety of sources that are useful starting points for the identification of nineteenth-century ceramics. We then explore the concept of ware and the problems involved in using ware-based systems of categorizing the historical ceramics. We then discuss the physical characteristics of the late eighteenth- and nineteenth-century ware triad, creamware, pearlware, and whiteware, and examine their manufacturing histories. We then turn attention to decoration-based systems of categorization and finally, to the range of decorative features that adorned nineteenth-century ceramics.

THE CATEGORIZATION OF HISTORICAL CERAMICS

Archaeologists generally agree that the ultimate goal of their discipline is to provide explanations for past behavior, explanations that are evaluated in terms of their power to predict patterning within or among data sets. Pattern, however, can only be recognized when the objects or abstractions used to define the pattern are arranged into analytically meaningful taxa. There are no "true" or "best" schemes for categorizing objects (see Dunnell 1986:150), and none should be cast in concrete. It also is improbable that one scheme can order data adequately to address all research problems. The question that constantly should be kept in mind is, what is the adequate level of detail that a particular scheme should possess? From a practical standpoint, the more involved a system becomes, the less other researchers will be inclined to use it.

Several options are available for arranging objects into analytical taxa, including grouping systems, paradigmatic classification, and taxonomic classification. Groups "are conceived as naturally bounded phenomena which have specifiable, functional properties in respect to other such phenomena" (Dunnell 1986:151). Classes are in some ways similar to groups, but they are elements of a scaling system that is "*imposed on*, rather than extracted from, empirical reality" (Dunnell 1986:152). More importantly, "things" often exhibit both grouplike and classlike properties (Dunnell 1986:151).

Paradigmatic classification uses an exhaustive combination of unweighted attributes such that all resulting classes contain the same amount of information (see Dunnell 1971). Although paradigmatic classification facilitates a shift in focus from one set of variables to another as research questions change, there are several drawbacks to the approach, drawbacks that can, under certain circumstances, be alleviated by using taxonomic classification. Taxonomy displays several advantages over paradigmatic classification. First, it is more sophisticated and is capable of illustrating more complex relations between and among classes than can paradigmatic classification. In cases where nonequivalent relations must be shown, taxonomy is the *only* classificatory system that can be employed (Dunnell 1971:83). How the dimensions of the classes are selected is left to the investigator. Dimensions are chosen with the expectations that (1) the classes formed by the association of attributes of various dimensions will bear on the research problem being investigated; and (2) the classes can be interpreted in a meaningful fashion.

With regard to the classification or grouping of archaeological objects (see Dunnell 1971, 1986), there has always existed a debate over the "meaning" of units employed to classify or group the objects, that is, whether classes or groups can be constructed and interpreted as cognates of what the makers had in mind. In the case of historical ceramics, documents such as bills of lading, advertisements, ceramic pattern books, and probate inventories suggest that perhaps certain dimensions were historically more "real" than others in terms of decisions made by the people who actually produced, marketed, and used the ceramics. Thus, a system that contains emic (Harris 1968:571-575) elements may be useful for arranging historical period ceramics into taxa that are appropriate for the study of certain behavioral aspects of nineteenth-century life. We return to this point later in this section.

Three immediate problems can face archaeologists when they attempt to categorize ceramic materials from the historical period: where was a particular piece manufactured, which company produced it, and when was it made (cf. Turnbaugh 1985a)? The following is offered as a first step toward familiarity with the ceramic literature.

Sources for Ceramic Identification

Antique collectors and ceramic historians have produced most of the descriptive literature on nineteenth-century ceramics, particularly materials from England. Most source books written by ceramic historians (e.g., Col-lard 1967; Godden 1961, 1963, 1964, 1965, 1966, 1968, 1971, 1972; Honey 1949, 1952; Mountford 1975; Towner 1957) are carefully researched treatises that contain a wealth of information on technology, design, and

marketing. With notable exceptions (e.g., Cunningham 1982; Lehner 1980; Ray 1974; Wetherbee 1980, 1985), however, studies by antique collectors often lack the attention to detail that ceramic historians provide. Although they can be useful starting points, especially for examining either the range of products manufactured by a particular firm or the pattern names under which goods were marketed, such studies should be used with caution. In other words, know your authors.

Other sources that can be consulted for pricing and marketing information are mail-order catalogs produced by large firms such as Sears, Roebuck & Co. and Montgomery Ward and Co. Many of the original catalogs have been reprinted (e.g., Israel 1968; Schroeder 1970), though the reproductions often are edited and have original pages deleted.

Until late in the nineteenth century, English pottery from the Staffordshire district dominated the refined-earthenware market in the United States and Canada. In the latter half of the nineteenth century, more than a third of Staffordshire export wares were shipped to the United States, with the remainder going to Canada, Australia, and other areas of the British empire (Godden 1972:7). Although clays suitable for refined-earthenware production were known from many parts of the United States east of the Rocky Mountains (Franklin and Forrester 1975; Ketchum 1970; 1971:3, 41, 97, 119-120; Roberts 1964:470; Spargo 1926:20), American potters limited themselves to the production of coarse earthenware and stoneware, since it was unprofitable for them to compete with the more refined British imports.

Tariff acts relating to pottery imports were enacted by the U.S. Congress beginning in 1789 and continued sporadically throughout the eighteenth and nineteenth centuries (U.S. Department of Commerce 1915:86-92). Despite these protectionist opportunities to produce and market their products on a wider scale, technological, logistical, and managerial problems prevented the American ceramic industry from producing refined earthenwares and porcelains on a more profitable basis until late in the nineteenth century (U.S. Department of Commerce 1915:19-26).

The most comprehensive and prolific chronicler of nineteenth-century English pottery and porcelain is Geoffrey Godden. Godden's work (1961, 1963, 1964, 1965, 1966, 1968, 1971, 1972) includes encyclopaedic treatments of earthenware and porcelain types, backmarks, and a masterfully edited and updated version of *Jewitt's ceramic art of Great Britain*, originally published in 1878. Jewitt's book, as revised by Godden (1972), offers detailed information on nineteenth-century factories or "works" in the major English pottery districts, concentrating on the years of operation of each factory, the wares produced, intended markets, and company backmarks.

Charleston and Griffiths (1970) present a comprehensive overview of the extensive literature on English ceramics. Although they are concerned

mainly with books published on the subject, they note that the *Transactions of the English Ceramic Circle* provide one of the most important sources for the study of the ceramic history of the British Isles from the seventeenth through the nineteenth centuries.

Other works frequently consulted by archaeologists hoping to delimit the manufacturing dates for backmarked wares are Cushion (1980), who primarily deals with English marks, and Chaffers (1952), Kovel and Kovel (1953), and Thorne (1947), who deal with Great Britain and other ceramic-producing countries, including the United States. There are literally dozens of works that discuss individual factories or ceramic types [e.g., *The Leeds Pottery* (Towner 1965)]. Godden (1972:263–266) provides an introduction to these sources.

Comparable works on nineteenth-century American ceramic producers are fewer in number. General guides to the types of pottery and porcelain of the United States, as well as to their identifying marks, include Barber (1904), Cole (1967), and Ketchum (1971, 1983). These guides were written for antique collectors, though they contain information useful to the archaeologist. Ketchum (1971) offers a valuable region-by-region summary of all types of coarse and refined earthenware, stoneware, and porcelain produced by American potters, and his *Pottery and porcelain* (1983) is one of the few descriptive works featuring color illustrations. Ramsay (1947) provides a general historical sketch of pottery developments in America, and Collard (1967) documents the British-dominated Canadian ceramic market.

Although there are scattered histories of specific American potters, potteries, or regions, such as Ketchum's (1970) *Early potters and potteries of New York State*, and various studies in *The Bulletin of the American Ceramic Society*, the first in-depth study of a pottery-producing district specifically designed for use by archaeologists is Gates and Ormerod's (1982) *The East Liverpool (Ohio) pottery district: identification of manufacturers and marks*.

As nineteenth-century British and American ceramics become increasingly desirable as "collectibles," authors targeting the antique collectors' market have produced some well-illustrated guides for identifying shapes, patterns, and backmarks (e.g., Gaston 1983; Heavilin 1981; Mason 1982; Wetherbee 1980, 1985), though the interpretations of ceramic history and technological development they offer should be viewed with caution.

Wares and Ware-Based Systems of Categorization

Most systems currently used to categorize nineteenth-century ceramics employ the *ware* concept as the basis for initial subdivision of assemblages. Widespread acceptance of this concept apparently is a function of the belief that wares are both discrete and easily identifiable entities, thus making them ideal units for ceramic analysis.

Miller (1980:1) notes that prior to the mid-1960s, most archaeological projects focused on seventeenth- and eighteenth-century sites, and the study of ceramics from those sites was oriented toward ware types derived from a breakdown of a classification system that separates ceramics into earthenware, stoneware, and porcelain. Major recognizable differences among the various wares facilitate this segregation, and the terminology used to describe archaeological assemblages parallels that used by contemporary manufacturers, merchants, and consumers. As interest in the archaeology of the nineteenth century began its rise in the late 1960s, it was natural to extend the emphasis on wares into the analysis of materials from sites of that period.

Two factors, however, mitigate against the usefulness of that extension. First, glaze and paste distinctions among wares produced during the nineteenth century are minor compared to those among earlier wares, making them difficult to sort and creating a lack of consistency among sorters. Second, by the nineteenth century ceramics, except for porcelain, were marketed more by type of decoration than by ware type (Miller 1980). The second point is the more important of the two for the purposes of this review, but we defer discussion of it to a later section.

We focus our attention below on problems inherent in ware-based schemes, as a background to discussion of ceramic technology and nineteenth-century white-bodied wares. The emphasis on wares is evident in schemes such as those outlined by Cotter (1968), South (1977a), Stone (1970), and Waselkov (1979). Waselkov (1979:65) notes that the taxonomic classification he employed was an

arrangement of the ceramics from Zumwalt's fort [Missouri] by certain analytic criteria relevant to manufacture, use, and distribution. These criteria [type of clay body (e.g., earthenware, stoneware, porcelain), paste hardness, paste and glaze composition, vessel form, surface decoration, and vessel shape] determine the respective classificatory levels (class, subclass, series, types, variety . . .).

Such an effort represents considerable work and an obvious knowledge of the material, yet the resulting system tends to be unwieldy, and terminology often is a stumbling block for other researchers hoping to fit their samples into the categories. Critical terms either remain undefined or are applied inconsistently or incorrectly, thus making it difficult to use the data from such a study for comparative purposes.

The single most disconcerting problem in ware-based ceramic analysis is the disagreement among researchers over the definitions of wares, such as pearlware, whiteware, and ironstone. Some authors (e.g., Gates and Ormerod 1982:7; South 1977a) use "whiteware" as a generic term to encompass any type of pottery or porcelain that is white or nearly white in color, while others, such as Price (1979), Lofstrom *et al.* (1982), Garrow (1982), Henry and Garrow (1982a), and Worthy (1982), have tried to provide objective means for distinguishing among the white earthenwares.

Worthy (1982:329–360), for example, advocates a system for classifying late nineteenth- and early twentieth-century ceramics that integrates technology, form, function, and decoration. She stresses the need to go beyond the three basic technological categories of earthenware, stoneware, and porcelain that have been used to encompass the variation seen in historical period ceramics. Her primary level of classification sorts sherds into one of four classes related to certain technological aspects of clay bodies: earthenware, stoneware (used incorrectly by Worthy to refer to semivitreous earthenware), porcelaneous stoneware [used incorrectly to refer to vitreous “hotel china” (Norton 1952:123, 1970:327–335)], and porcelain. Definitions of each class are based on variable states of the following characteristics: “paste color, degree of vitrification, opaqueness versus translucence, interface between the body and the glaze, manner in which a break occurs, and smooth versus granular appearance of the paste” (Worthy 1982:334). Worthy believes these divisions reflect the technological development that led to significant variation in post-1850 ceramic bodies.

Worthy's efforts to update the increased range in variation among body types from earthenware to porcelain fall short of the mark, even though many of the sorting criteria she proposes are quite workable. Some of the problems with her system revolve around the sources she consulted, sources that also contributed to errors in terminology. For example, Spargo (1926:39) is cited following Worthy's (1982:335) definition of stoneware, although Spargo's contribution to the literature on American ceramic history is based on his extensive experience as a collector and not as a ceramic technologist.

The use of a materials science approach to ceramic categorization may offer a means of reducing such errors (Bronitsky 1986). Cohen (1980:xii) defines materials science as the “generation and application of knowledge relating the composition, structure and processing of materials to their properties and uses.” “Ceramic ecology” studies (cf. Matson 1965:202) investigate the cultural context of production and use. At the most basic level, the context includes the choices and problems encountered in production and the adjustments made in materials in order to arrive at a finished product (cf. van der Leeuw 1976:393, 1984:57). Bronitsky (1986:211) notes that “Understanding these choices requires more accurate assessment of the system of ceramic manufacture at hand and the existing knowledge system: the kinds of clays utilized, the reasons for their use, and the kinds of manipulations required to arrive at the final ceramic product.”

We have taken a materials science approach to the categorization of ceramics presented in this paper because there must be a realization that wares are not static entities; rather, wares (i.e., bodies and surface treatments) are points along a continuum of technological development. Familiarization with clays and ceramic technology is critical to understanding

nineteenth-century ceramics, how they were produced and why they have the appearance they do, and thus we examine these topics in some detail below as background for subsequent discussion of the concept of technological continuity as it relates to ware development. The section concludes with a discussion of individual white-bodied wares (e.g., pearlware and whiteware), since they appear in the ceramic literature and are used by archaeologists, but we discuss them under headings that are grounded in technology (nonvitreous, semivitreous, and vitreous white-bodied wares).

Clay and Ceramic Technology

Clays are the basic building blocks of ceramic technology, and because clay-bearing rocks usually contain more than one mineral and the various clay minerals differ in chemical and physical properties, the term may signify quite different things depending on the perspective of the user. Keller (1985:321) notes that the geologist views clay as a raw material for shale and the pedologist, or soil scientist, views it as a dynamic system to support plant life while ceramists usually emphasize aluminosilicate content and plasticity as in the following [somewhat general] standard definition: clay is "an earthy or stone mineral aggregate consisting essentially of hydrous silicates and alumina, plastic when sufficiently pulverized and wetted, rigid when dry, and vitreous when fired at sufficiently high temperature" (American Ceramic Society Committee on Standards 1928:347).

The clays used in the manufacture of different wares are selected primarily on the basis of physical properties, though the importance of chemical composition must not be ignored (Grimshaw 1971:309). A classification of clays into primary and secondary types reflects both their geological origin and their potential for use in pottery making (Rhodes 1973:11-12). Grimshaw (1971:40) prefers the terms "residual" and "sedimentary," since the terms "primary" and "secondary" are misleading.

Residual clays are those that have not been transported by natural agencies and that are found side by side with altered igneous rocks, from which they were formed. Sedimentary clays, by contrast, are those that have been removed from their origin by natural agencies (Worrall 1975:48). The nature of sedimentary deposits is determined largely by the mode of transportation and deposition (Grimshaw 1971:40). Residual clays usually can be extracted from the parent rock and obtained in a comparatively pure state, whereas sedimentary clays rarely are obtained pure because of the impurities picked up and retained during transportation (Worrall 1975:48-49). Residual clays tend to contain less fine material than do sedimentary clays;

consequently, they are less plastic than the latter and have less strength in the dry state (Worrall 1975:52). Ceramic manufacturers have long capitalized on the complementary properties of the two groups of clays.

The most elemental point of differentiation in ceramic classification is determined by the clay and the temperature at which it must be fired to produce a durable ware (Cooper and Royle 1978:3; Greer 1981:14). A concept critical to this notion is vitrification, the process whereby clays harden, tighten, and finally become glassified as firing temperatures increase beyond red heat (Rhodes 1973:17-18). The composition and properties of glazes in relation to ceramic bodies also are important variables to consider when evaluating the durability of a ceramic body. In addition, both firing temperatures and glaze properties serve as limiting factors when considering the decorative methods feasible for use on a particular ceramic body.

We examine below the process of vitrification and the types of glazes that were developed during the nineteenth century. We then turn attention to the triaxial system that will be used as an organizational framework for the discussion of white-bodied wares.

Vitrification. Vitrification [our discussion of which is based on Cooper and Royle (1978:3, 5-7), Grimshaw (1971:736-738) and Searle (1924:551-555)] begins when the fusion point of the least refractory constituents (i.e., those with the lowest melting point) is reached. The temperature at which the process begins varies widely depending on the differing reactions to heating of the various ceramic materials involved. With most of the crude clays used in the ceramic industry, vitrifications begins at about 750 to 800°C.

Simultaneous physical and chemical changes occur during the vitrification process. Total volume, porosity, and permeability of the material decrease as the interstices are filled with molten material and as solid material is dissolved. As the amount of fused material increases during heating, the mass becomes more mobile but loses strength. After cooling, however, the strength of the body increases as a result of the large amount of fused glassy material bonding the other particles firmly together. Control of vitrification involves gradually producing fused material while retaining the article's shape. This is accomplished by the presence of a sufficient number of highly refractory particles (i.e., particles with high melting points) that act as a skeleton unaffected by the motion of the molten portion of the body.

Vitrification range refers to the range in temperature between the commencement of fusion and the point at which the materials being fired begin to lose shape because of overheating. The *finishing temperature* of a

ceramic article, the highest temperature at which it is fired at each firing stage [e.g., biscuit (initial) versus glaze (glaze) firing], depends on its composition. However, it is always below the temperature at which serious loss of shape occurs because of overvitrification of the body. Color is affected to a great extent by the finishing heat, and potters often compromise body strength by allowing this consideration to determine maximum firing temperatures.

Glazes. Glazes are applied to ceramic bodies to seal the body, to improve vessel appearance, and to protect decoration. They resemble glasses in structure and texture, but their composition is adjusted to ensure both a suitable but not total amount of vitrification and a more viscous fluid (Grimshaw 1971:341; McNamara 1948:509). Glazes chosen for a ceramic body must fit that body, that is, the coefficient of thermal expansion of the body should be similar to that of the glaze; otherwise, peeling (when the body has a greater expansion than the glaze) or crazing (when the glaze has the greater expansion) will occur (Grimshaw 1971:342; Smith 1953:298). There are various ways to categorize glazes: according to the temperatures at which they mature, as to whether they are raw or fritted, or on the basis of their chemical composition (Rhodes 1973:170–182). Characteristics of the most important types are summarized below.

Raw glazes are compounded of insoluble raw materials and fuse after they are applied to the body. The raw materials must be insoluble because the glaze is prepared by wet grinding, and any water-soluble substances would be lost in solution and leaching. Thus, materials such as soda, ash, borax, and potash cannot be used for raw glazes. Raw glazes include high-melting compositions fluxed with feldspar, lead oxide, and lime (McNamara 1948:510) [fluxing elements are those substances added to, or occurring naturally in, a ceramic body to enable it to fuse more readily (Worrall 1975:187)].

Fritted glazes are mixtures of two or more materials that are heated until they melt into a glass, then quenched in water, and then ground to a fine powder. Fritting is carried out for several reasons. Some materials are poisonous and dangerous to handle, such as lead compounds, and, while insoluble in water, they are soluble in dilute acid before and in some cases after firing. Lead solubility must be kept to minimum levels specified by law, and fritting can eliminate this problem (Cooper and Royle 1978:15). The soluble components of a glaze are fritted prior to use to convert them into an insoluble form by fusing the soluble components and other low-melting-point compounds (Grimshaw 1971:343).

If the lead oxide in a glaze batch is combined as a silicate before it is applied to the ware, it is much more resistant to leaching by weak citric acid (from fruits) and acetic acid (from vinegar) (McNamara 1948:512).

The most common nineteenth-century glazes were alkaline, feldspathic, and raw lead glazes. Alkaline glazes consist primarily of silicates of potash and soda (Grimshaw 1971:342). Although low-fire alkaline glazes commonly were used in ancient Egypt and in the Near East to obtain colorful decorative surfaces, they were little used in Europe (Honey 1952:276). Alkaline glazes are fluid and yield a glassy appearance, but they are highly soluble and have a tendency to craze on most clay bodies (Rhodes 1973:170-171). Salt glaze was used widely on high-fired utilitarian stoneware during the nineteenth century and was obtained by throwing salt into the kiln when the fire reached its greatest heat. This process results in a thin, intensely hard film of a silicate of soda and alumina (Honey 1952:276). Rhodes (1973:287) notes that one problem with salt glazing is that the salt vapors will not descend inside a vessel, and thus the interior must be covered with a separate glaze (e.g., a slip glaze such as Albany) or left unglazed.

Grimshaw (1971:342) characterizes feldspathic glazes as mixtures of silica and alumina with alkaline or alkaline earth bases. The fusible feldspathic rock known as *petunse* (china stone) is powdered and mixed with lime, potash, sand, or quartz and other ingredients such as clay (to control thermal expansion) to produce a translucent, highly vitrified glaze at high temperatures. Feldspathic glazes typically are used on hardpaste porcelain (Honey 1952:276-277).

The smooth, opaque, white Bristol type of stoneware glaze, developed during the Victorian period in England to cover the usual drab buff body of utilitarian stoneware, is composed of feldspathic materials used in porcelain glazes, but it also contains a combination of china clay and zinc oxide to give the characteristic opaque white color (Greer 1981:210, 212). Greer (1981:212-213) notes that variations of this glaze still are used in the ceramic industry.

Lead glazes are similar to feldspathic glazes but are less refractory and have an improved appearance because of the addition of lead compounds (Grimshaw 1971:342). Lead in a glaze is present as lead oxide (litharge, PbO), but it may be introduced in other forms such as red lead, white lead, and lead carbonate (McNamara 1948:515). Hughes and Hughes (1968a:84-85) state that prior to 1750 lead glaze was applied by dusting ceramic surfaces with finely ground natural sulfide of lead (smithum or galena), which resulted in a rich yellowish or brownish glaze after firing once at a moderate temperature. A glossier, clear glaze was obtained by substituting finely ground calcined lead for smithum. Fluid lead glazes were in use in England by 1748, and together with the development of the double-firing process (in which wares are fired in the biscuit stage first, then dipped

into a liquid glaze and refired in a glost oven), their adoption served as one of the most important events in the production of commercial ceramics. Basically the glaze was prepared by combining calcined lead with other fusible materials (including calcined flint), grinding it, and adding water to obtain a creamy consistency.

One characteristic of lead glazes that makes them so popular is that they have long firing ranges and are not as subject to over- or underfiring as are leadless glazes. In addition, they are less sensitive to slight variations in chemical composition that might result from poor preparation (McNamara 1948:515). However, when first used during the eighteenth century the lack of sufficient control over body compositions and firing temperatures mitigated against consistently perfect results (Hughes and Hughes 1968a:85). L. Sussman (pers. comm.) notes that lead oxide was an important ingredient in glaze recipes throughout the nineteenth century (see also section on "traditional lead glaze recipes" in Green 1979:80–82). By 1900, raw lead compounds were used almost exclusively as constituents of glazes, with the result that lead poisoning reached alarming proportions (Ratcliffe and German 1953:217).

A leadfree glaze that included borax and feldspar among its ingredients was developed about 1820 by John Rose of Coalport, England, in an effort to reduce the health hazards associated with lead-based glazes (Honey 1952:277; Hughes and Hughes 1968a:85). However, it was costly to produce and was used rarely (Hughes and Hughes 1968a:86). Fritted lead glazes of low solubility were developed before 1900, but it was not until the beginning of the twentieth century that they were used in Britain (Ratcliffe and German 1953:217). Because of governmental regulations on the use of soluble lead compounds, fritted lead borosilicate glazes became the most commonly used twentieth-century glazes for tableware (Grimshaw 1971:342; Ratcliffe and German 1953:217–218; Rhodes 1973:94).

The Triaxial System. A *triaxial* or *ternary* system of classification has long been used by ceramists to organize the mineral constituents of white-bodied ceramics containing clay, feldspar, and quartz as their primary components (Hamme 1985:235–236; Norton 1970:178–180). These bodies also may contain small amounts of alkaline earths or calcium carbonate (Norton 1970:271–272), which serve as fluxes. Grimshaw (1971:309) notes that white-bodied wares of all types, including porcelain, bone china, and non-vitreous to vitreous tablewares, combine white-burning kaolin clays (principally residual clays, though there are some sedimentary, darker-burning kaolins) with ball clay (a sedimentary clay) to promote strength in molded shapes. Kaolin is characterized by coarse particle size and a low degree of plasticity, while ball clays are fine-grained, highly plastic clays (Rhodes 1973:19–21).

If one examines typical body compositions of white-bodied ceramics (e.g., as given in Newcomb 1947:230; and Norton 1952:124), they will appear to be fairly similar. As Rado (1975:153) notes, however, the temperature at which the reactions within the triaxial system are arrested is far more decisive in determining the end product than is body composition. Thus, subdivision of white-bodied ceramics organized according to degree of vitrification of the body (i.e., on the basis of whether it is nonvitreous, semivitreous, or vitreous) can provide ceramic researchers with some objective means for ware identification.

Absolute identification is hampered by the fact that the terms earthenware, china, and porcelain often were used indiscriminately by producers and marketers of white-bodied ceramics. By the beginning of the twentieth century the problem had become so acute that members of the ceramic industry complained about ambiguity in terminology (U.S. Department of Commerce 1915:193). McNamara (1948:473) notes that Watts had been working toward a satisfactory classification of "dinner ware" since the 1920s. Watts's (1939:314) classification was approved by the White Wares Division of the American Ceramic Society and categorized white ceramic bodies on the basis of "percent absorption," "mechanical shock resistance" (related to hardness), and "translucency."

Several general statements can be made concerning covariation among these three dimensions in white-bodied ceramics. The higher the firing temperature at which a (white) ceramic body matures, the less distinguishable the interface between the clay body and the glaze will be, and the sharper a broken surface will appear. The more absorbent a ware, the more subject the glazed surface will be to crazing and discoloration. Translucency depends on the degree of vitrification; therefore, a body with high-absorption qualities will have poor translucency (i.e., will be opaque), and a body with low absorption qualities (i.e., a highly vitrified body) will be translucent (Newcomb 1947:222). Although sophisticated procedures exist for measuring dimensions such as translucency (Searle 1924:633-634), hardness (Grimshaw 1971:865-870; C. Smith 1977:163), and absorption (Grimshaw 1971:424; McNamara 1948:329-330), researchers who study white-bodied ceramics can use less elaborate tests to provide an objective starting point for grouping materials.

It is unfortunate that "there is no simple procedure for determining the temperature at which a vessel was fired" (Greer 1981:15), as this would greatly simplify identification of white-bodied wares that fall within specific firing ranges: nonvitreous (1100-1150°C), semivitreous (1150-1250°C), and vitreous (1250-1520°C) [estimates based on modern firing ranges (Newcomb 1947:223-230; Norton 1952:123-124)]. However, we can relate firing temperature to percentage of water absorption (percentage increase in weight on saturation with water), which can be measured by following procedures outlined by Grimshaw (1971:424) and McNamara (1948:329-330).

Nonvitreous wares have 10–15% absorption and semivitreous wares 4–10%; vitreous wares vary significantly: bone china, 0.3–2%; hotel china, <0.3%; and hardpaste porcelain, 0% (Norton 1952:123; Watts 1939:315). A qualitative “tongue test” for absorption has been suggested by Spargo (1926:31): If one touches the broken edge of a sherd to the tongue, a more absorbent body will adhere to the tongue while a less absorbent, more highly vitrified body will not.

Relative translucency (i.e., the degree to which a ceramic body permits the passage of light) can be determined by holding items of similar thickness an equal distance from a strong light source (Newcomb 1947:223). Nonvitreous bodies are opaque, semivitreous bodies may be slightly translucent, and vitreous bodies exhibit medium (hotel china) to high (bone china and hardpaste porcelain) translucency (Norton 1952:223; Watts 1939:315).

Bronitsky (1986:221) notes that “Hardness is probably the physical property most commonly assumed to be related to ceramic strength and durability.” Approximately 30 hardness tests have been devised (C. Smith 1977:163), but probably the simplest to use on white-bodied ceramics is the Mohs hardness scale for scratch-hardness testing. With the Mohs scale, the test item is scratched in turn by a series of mineral standards that increase in hardness. The hardness value is that of the mineral that first produces a positive indentation or scratch when viewed under a lens (Bronitsky 1986:222–223; Grimshaw 1971:866). Grimshaw (1971:866) provides a typical series of minerals used in the Mohs scale, along with some convenient substitutes.

Bronitsky (1986:222) raises two objections to using the Mohs scale on archaeological ceramics: (1) archaeological ceramics are quite heterogeneous in composition, so that hardness might vary depending on what part of the sherd is measured; and (2) no tests of intersubjective reliability have ever been carried out (Rye 1981:121) to determine the extent to which measurements made by different individuals may vary. There is no doubt that the question of intersubjective reliability must be addressed in setting up test procedures. However, we contend that the archaeological ceramics referred to by Bronitsky are prehistoric ceramics as opposed to historical period ceramics. The latter, particularly the white-bodied wares discussed here, are much more homogeneous in composition. Bronitsky (1978) concludes that most ceramic pastes of (prehistoric) archaeological interest fall between 2.5 and 4 on the Mohs scale; thus, the values produced by the scale are of little comparative value. This should not be the case with historical period ceramics. Mohs scale values taken on both the pastes *and* the glazed surfaces (taking into consideration the twice-fired nature of most white-bodied ceramics) should exhibit considerable differences when comparing nonvitreous, semivitreous, and vitreous bodies. We would expect hardness values to increase (predictably) as bodies become more vitrified. Once values are obtained, however, caution should be exercised when interpreting them, since, as Grimshaw (1971:871) points out, many factors affect the strength of ceramic materials:

1. the chemical or mineralogical composition of the material;
2. the physical properties of the material;
3. the mode of preparation of the material;
4. the mode of manufacture of the article;
5. drying conditions;
6. burning conditions;
7. the temperature at which the article or material is used or at which its strength is determined;
8. other conditions to which the article or material is or has been subjected, including weathering, sudden changes of temperature, prolonged heating, etc.

We currently are conducting tests along the lines suggested above using ceramics dating from approximately 1850 to 1930 (Majewski n.d.). In addition to providing quantitative data that will aid in distinguishing among white-bodied ceramics on the basis of their physical characteristics, we hope to be able to establish the range of decorative variability for each class of bodies through time.

Technological Development in the British and American Ceramic Industries

It is essential that one understand the separate trajectories of development in the British and American ceramic industries as background to a discussion of the characteristics that can be used to differentiate among white-bodied wares found on nineteenth- and early twentieth-century North American sites. For the sake of simplicity, the post-1800 British ceramic tradition can be divided into two branches: refined earthenware and bone china. With the development of creamware, pearlware, and whiteware, the British dominated the world refined-earthenware market from the late 1700s through roughly 1880. From about 1850 through the 1880s, the production of classic ironstones for export (heavy, semivitreous ceramics decorated with relief molding or left plain) was intensified by British potteries. After 1880, lighter weight ironstones were produced, but it appears that these wares never were popular for use as everyday table service by British consumers. The British continued to purchase non-vitreous white-bodied earthenwares ["fine earthenwares," see U.S. Department of Commerce (1915:136)] well into the twentieth century (Newcomb 1947:230), possibly because they afforded greater decorative variability. Nonetheless, it appears that heavier weight semivitreous and vitreous wares continued to be made in British potteries well after the decline in popularity of the classic ironstones, both for export [see backmarked vessels from excavated assemblages in northeast Missouri (Majewski and O'Brien 1984) and from the original Phoenix townsite (Henry and Garrow 1982a:314-316)] and for use in England (Wetherbee 1985:179).

Since the late eighteenth century, bone china has represented a distinct parallel branch in the British ceramic tradition. Bone china always has been the dominant British-made porcelain for home consumption and for export. (See Rado 1971, 1975 for the history of hardpaste porcelain versus bone china manufacture in England and a comparison of their properties.) Newcomb (1947:225) notes that although bone china is quite translucent, its poor resistance to impact or thermal shock works against its use as tableware in eating establishments and often makes replacement costs high for private service.

After the Civil War, white-bodied wares produced by the American ceramic industry began to compete directly with British imports (see Cheek *et al.* 1983:103). It was not until late in the nineteenth century, however, that American producers began to capture the market [see manufacturer names and date ranges of ceramic dining sets recovered from the original Phoenix townsite (Henry and Garrow 1982a:314–316)]. The American white-bodied ceramic tradition essentially is unilinear, characterized by increasing refinement of semi-vitreous and vitreous ceramic bodies (U.S. Department of Commerce 1915:170).

Some ambitious American potters attempted to produce bone china on a profitable basis (see below), but porcelain production never was a major focus of the industry. One reason for this might be that English bone china and continental European and oriental hardpaste porcelains were readily available to those who could afford them. Nonvitreous white-bodied wares, the ceramic body of choice for transfer-printed British wares exported to the United States in large quantities, never were produced in appreciable amounts by American potteries until after approximately 1850, though the U.S. Department of Commerce (1915:67) reported that small quantities of “cream-colored,” or “CC,” wares were being made by 1850.

Semivitreous wares were being produced as early as the 1860s in New Jersey (Ketchum 1983:170), and by 1890 American-made, semivitreous and vitreous white-bodied wares were making strong inroads into the American ceramic market. The development of semivitreous china apparently occurred as an outgrowth of the “white granite” industry about 1890 in East Liverpool, Ohio; this industry was based on the introduction of better clays and mixtures combined with higher firing temperatures (Ries and Leighton 1909:188). White granite refers to an American-produced, nonvitreous-to-semivitreous body made to imitate the British classic ironstones. Semivitreous china represented the bulk of dinnerware used in the average American home until at least the 1940s (Newcomb 1947:223). The white granite wares of some manufacturers gradually were made denser and more impervious, resulting in what was called vitreous china, a product that was in a position to compete favorably with European-produced tableware (U.S. Department of Commerce 1915:170). Vitreous hotel china and household china were characterized as distinctively American (Newcomb 1947:225–230; U.S. Department of Commerce 1915:69–70).

White-Bodied Wares

In the following summary of nineteenth-century white-bodied wares we begin with a discussion of creamware, since its nonvitreous body composition falls within the triaxial system of classification and it represents the earliest stage of the refined earthenware tradition. The emphasis on refined earthenware production beginning in the latter half of the eighteenth century not only shaped subsequent development of the British ceramic industry but also greatly influenced that of the United States.

Heavy clay products such as brick and tile, terra cotta, coarse earthenware, faience, and majolica are made from a variety of residual and sedimentary clays that do not vitrify excessively at the temperature of firing. Clay color usually is a secondary consideration in these bodies; the color of the clay after firing at temperatures between 950 and 1150°C varies from pink, buff, tan, red, and brown to black (Grimshaw 1971:309; Rhodes 1973:22).

As early as the mid-1700s British potters rejected the color limitations of coarse earthenware bodies in their search for more elegant, light-colored wares, perhaps in an effort to compete with oriental porcelains that had been imported to England since the sixteenth century (Hughes and Hughes 1968b:19). The British had long imported Rhenish stonewares and during the 1600s attempted to imitate these wares. By the mid-1700s large quantities of salt-glazed stoneware were being manufactured in England. Although the technique was used for some utilitarian wares, the major use was for expensive, highly decorated wares (Greer 1981:17), many of which were exported to colonial America in the eighteenth century (Gusset 1980:7; Noël Hume 1970:114–117). [For a thorough discussion of utilitarian stoneware see Greer (1981); for nonutilitarian salt-glaze stoneware see Mountford (1971); also Turnbaugh (1985b).]

This British fine, white, salt-glazed form of stoneware is of historical significance for studying the development of white-bodied wares because pioneering efforts in the development of creamware were made in the eighteenth century by experimenting with the clays that had yielded the stoneware body. Noël Hume (1970:123) notes that ceramists Thomas Astbury and Thomas Whieldon mixed ground flint into the glaze, which yielded white salt glaze at high firing temperatures and a cream-colored body at lower temperatures. This new body offered an entirely new range of decorative possibilities. In a diagram illustrating the evolution of English plate rims between roughly 1740 and 1785, Noël Hume (1970:116, Figure 35) shows the continuity in form and decoration from white salt glaze to creamware to pearlware.

Nonvitreous White-Bodied Wares. Towner (1957:1) notes that creamware was the direct descendant of the lead-glazed wares of the Middle Ages.

In its eighteenth-century context it may be viewed as an improvement on tin-glazed refined earthenware and as an evolution out of the technology used to produce light-bodied, salt-glazed stoneware (Collard 1967:105; Noël Hume 1970:123; Towner 1957:1-4). Refinements in composition of the ceramic body, made possible in part through the introduction of plaster molds about 1750 (Shaw 1970), allowed thinner-walled vessels to be manufactured and led potters to experiment with lead glazes, which were fluid and into which vessels could be dipped. This process perhaps allowed potters to produce fairly consistent glaze colors from vessel to vessel (Mankowitz 1953:44; but see Noël Hume 1973:239) and led to the immediate and widespread popularity of creamware vessels.

Considerable confusion and debate exists in the literature over the use of the term creamware, a term that never was used by potters or merchants (Miller 1980). Rather, the term is a misnomer for the contemporary name cream-colo(u)red, or CC, ware. Some authors (e.g., Griffiths 1978) use creamware and cream-colored ware to refer to different types of late eighteenth- and early nineteenth-century pottery, but they do not list defining characteristics. In at least one instance (Sussman 1978), cream-colored ware is mentioned as being an earlier ware than creamware. Part of this confusion could be a result of slight changes in the glaze composition over time. Sussman (1978:100), for example, states that the creamware glaze lightened in color during the early nineteenth century, a phenomenon that is mentioned by Noël Hume (1973:239), who adds that variation in color was common, even on the same vessel, and thus one should use caution when applying temporal significance to color variation. Towner (1957:3) discusses three creamware glazes that varied widely in color.

The term "Queenware" (or Queen's ware) also is used to refer to cream-colored ware, though Noël Hume (1973) suggests this term may have more to do with an actual vessel pattern produced by Josiah Wedgwood. A common misconception is that Wedgwood invented creamware, though the cream-colored body had been in existence for at least a decade before Wedgwood's Queen's ware appeared (Noël Hume 1969a:390).

By the end of the eighteenth century, cream-colored ware from English potteries monopolized much of the English and American markets. In self-defense, European potteries began to manufacture similar wares (Collard 1967:105) at the expense of their earlier product, faience, but they could do little to make inroads into the stranglehold that England had on the refined-earthenware market. Thus, the French scholar Fauyas de St. Fond remarked in 1799 that "travelling from Paris to Petersburg, from Amsterdam to the furthest part of Sweden . . . one is served at every inn with English ware . . . and vessels are loaded with it for the East and West Indies and the continent of America" (Hayden 1952:135-136).

The popularity of cream-colored ware began to wane in the late eighteenth century as a contemporary ware, commonly termed "pearlware" by archaeologists, began to eclipse it (Miller 1980:15-16). Although cream-colored ceramic bodies continued to be manufactured throughout the nineteenth century, they mainly were undecorated, and the variety of forms available was limited to vessels other than dinnerware (Miller 1980:3). Cream-colored ware was used for table services as late as 1820 (e.g., for British military services in Canada; see Sussman 1978:98-100), but such cases appear to have been infrequent.

Pearlware, introduced by Josiah Wedgwood in 1779 as an alternative to cream-colored ware [he considered it a *change* rather than an *improvement*, as indicated in an August 6, 1779, letter to his partner Thomas Bentley (Finer and Savage 1965:237)], was created by adding a small amount of cobalt oxide to the glaze used on cream-colored vessels to mask its natural yellowish body and to create the slightly bluish tint that characterized much of the China trade porcelain of the period (Lofstrom *et al.* 1982:5; Noël Hume 1969a:390; see also Noël Hume 1969b). Noël Hume (1969a:390) states that the pearlware body was whiter than that used for creamware, as Wedgwood and other manufacturers claimed, but Sussman (1977:105) notes that contrary to such claims, comparisons fail to reveal any differences either in hardness or in color between creamware and early pearlware fabrics. Towner (1957:3-4) goes one step further and classifies pearlware as a creamware variant:

Only a few minor changes in the development of creamware were made after this (1768). Of importance, however, was a considerable increase about 1780 in the production of creamware, the glaze of which was tinged with blue. This glaze when applied to a somewhat modified creamware body produced a cool grey-colored ware and is usually referred to as "pearlware."

As in the case of creamware, the term pearlware was not used by Wedgwood or any other ceramic producer to describe the whitened earthenware. Wedgwood called his product *Pearl White*, and other producers used terms such as *Pearl China*, *Pearl Stone China* (Miller 1980:3), *Blue-and-White*, and *China Glaze* (Noël Hume 1969a:391-392). The term *Pearl Ware*, according to Miller (1980:2), was used as a part of the manufacturer's mark on an unglazed white body developed by the Chetham and Wooley pottery (1796-1810) that was similar to jasper and basalt wares. The word "PEARL" appeared on many later nineteenth-century semivitreous ironstones, the bodies of which (but not the glazes) had a slight bluish tint (see below) (Miller 1980:3).

Pearlware usually is characterized in the literature as having a bluish glaze, visible as puddling in crevices of a vessel (Mankowitz 1953:4). Lofstrom *et al.* (1982:6-7) note that the

combination of a naturally yellowish lead glaze and a blue pigment results in a glaze that is blue where thickly puddled, such as around a vessel foot or in other nooks and crannies, but which is uniformly *greenish* where thinly distributed over the undecorated surface. This is best seen on undecorated interior or bottom surfaces.

They also present a range of Munsell values, 10GY 9/1, 5GY 9/1, 5GY 8/1, and 2.5GY 9/2, with one unusually deep blue example: 5BG 8/1. Sussman (1977:108), however, recognizes differences in shades between eighteenth- and nineteenth-century pearlware vessels. She states that the earlier pieces exhibit a blue that is more gray-toned (5BP 3/6–3/10) than the later pieces, especially those manufactured after 1820, which exhibit brighter purple-toned colors (7.5BP 3/8–3/10).

Blue is almost always the underglaze color used on transfer-printed pearlware vessels, since cobalt is a remarkably reliable coloring oxide not affected by the atmosphere in the kiln (Cooper and Royle 1978:52). The behavior of other metallic-based colors for underglaze use at high glaze firing temperatures was not well controlled by potters until the 1820s (Collard 1967:117–118; Shaw 1970:234–235). (See discussion of color considerations in ceramic decoration in subsequent section.) However, a host of colors occurs on overglaze handpainted pearlwares, since colors could be applied without regard to the effects of the glaze or firing temperatures on the mineral constituents of the coloring agent. Green does occur as a color on shell-edge decorated pearlwares (e.g., Noël Hume 1969a:394; Sussman 1977:106), but because of the volatile nature of the copper oxide from which it is produced (Caiger-Smith 1973:225), the decoration generally has a soft, fuzzy edge (see Majewski and O'Brien 1984:111, Plate 3).

We suggest, as does Price (1979:15), that classification of pearlware should be based on the color of the painted decoration as well as on the overall glaze tint. Basing one's determination on those combined attributes can prevent embarrassing mistakes, such as classifying brown, purple, and red underglaze transfer-printed whiteware vessels as pearlware (e.g., Waselkov *et al.* 1975: 64–67).

Nonvitreous white-bodied earthenwares, or *whitewares*, were the most enduring of the wares of the creamware-pearlware-whiteware triad, and they are best seen as a logical development along a continuum of refinements in paste and glaze. As Miller (1980:18) notes, pearlware dating prior to the 1820s had a distinctly blue tint. As bone china became popular in the first quarter of the nineteenth century, earthenware producers probably were influenced to create a whiter ware. Most whitewares are almost pure white in color, closely approximated by Munsell 10Y 9/1, an extremely pale yellow (Lofstrom *et al.* 1982:8).

Lofstrom *et al.* (1982:8) erroneously suggest that the shift from pearlware to whiteware represents a shift from a lead glaze to a lead-free glaze. As discussed earlier in the section on glazes, lead-free glazes met with little

commercial success in the English earthenware industry until after 1900. It probably was the case, as suggested by Miller (1980:18), that while cobalt in the pearlware glaze was decreased, it was added instead to the body to create a whiter appearance.

Whiteware almost always is decorated, with overglaze and underglaze handpainting and underglaze transfer printing in a variety of colors being the most common methods of applying the decoration.

Semivitreous and Vitreous White-Bodied Wares. *Ironstone* is a term used to refer to a semivitreous ware intermediate in hardness between earthenware and porcelain, a hardness caused by the inclusion of china stone, or petunse, in the paste (Collard 1967:125; Price 1979:12). Following South's (1974) lead, ironstone is grouped together with whiteware in many analyses. In a sense South is correct, since once technological improvements in the production of white ceramic bodies began about 1800, many variants of nonvitreous- and semivitreous-bodied earthenwares coexisted throughout the rest of the nineteenth century and into the twentieth century. Potters often made several variants, decorated them in various ways, and marketed them under a plethora of names. However, since the term ironstone is firmly ingrained in the archaeological literature, it warrants further discussion, even if we decide in the end that we are splitting hairs by trying to distinguish among ceramic bodies that are simply points along a continuum.

Based on her monumental study of nineteenth-century pottery and porcelain in Canada, Collard (1967:125-130) defines two distinct phases in the history of ironstone in the Canadian market, phases that appear applicable to the distribution of ironstone in the frontier United States as well. The first type of ironstone was a finer, dense earthenware influenced by and developed by English manufacturers as a competitive response to oriental porcelain. A heavier, less expensive type was developed by resourceful and adaptable Staffordshire potters around midcentury as a response to the influx of hardpaste porcelains from France into the frontier markets in Canada and the United States.

Josiah Spode made a commercial success about 1805 of marketing a fine-grained, high-fired earthenware he called "Stone China," which approximated porcelain in terms of hardness. Eight years later, Charles Mason introduced what he called "Mason's Ironstone China" and claimed that it contained "slag of iron" (Collard 1967:127). John and William Turner had patented a similar ceramic body in 1800 and undoubtedly influenced both Spode's and Mason's inventions (Collard 1967:125-126).

These early high-quality ironstones were faintly tinted blue-gray to resemble Chinese porcelain, and colorful decorative patterns imitated oriental prototypes (Cameron 1986:215; Collard 1967:126, 129; Hughes 1961:157). It is curious, however, that this kind of ironstone does not appear in reported archaeological assemblages dating to the early nineteenth century [e.g., Thomas McVey's residence on Ile-aux-Noix, Quebec (Grange 1980); Fort Atkinson, Nebraska (Carlson 1979); the Hermitage, Tennessee (Smith *et al.* 1977)]. Possibly it is not being distinguished from pearlware (e.g., Benthall 1973:35, describes pearlware plates and cups with "Blue T. Print & Gold"), or its absence may be related to the frontier nature of the aforementioned sites or to the social status of their inhabitants. Availability should not have been a problem though, if, as Collard (1967:128) notes: "The amount of Mason's ironstone still to be found in old settled parts of Canada, such as the Eastern Townships, is testimony to the trade Mason built up with the colonies." One might have expected it to appear in the assemblages analyzed from nineteenth-century Washington, D. C., by Garrow (1982), or at the Green Mansion in Vermont (Spencer-Wood and Heberling n.d.), or at Yaughan and Curriboo plantations (Wheaton *et al.* 1983), but it does not.

Improvements in the ironstone body during the 1840s (Hughes 1961:166, 172-173) led to a number of popular late Georgian-through Victorian period wares. One variant (what we term classic ironstone because it is the heavy, often undecorated body always referred to as ironstone in archaeological reports) was advertised as being suitable for the "country trade" and became ubiquitous in frontier households (Collard 1967:125-130, 132; Fontana and Greenleaf 1962:92).

Hughes (1961:173) notes that these wares "were largely demanded in America, the entire output of several potters being exported to that country." Sussman (1985:7) agrees, stating that "Ironstone, or white granite, was manufactured specifically for export to North America." Remarks in Jewitt's *Ceramic art of Great Britain* on the varieties of ceramics produced by various manufacturers amply illustrate this attention to American markets:

The Charles Street works [Hanley] was taken over by William Ridgeway [sometime between the late 1830s and mid-1840s], who changed the manufacture to that of white granite goods for the American markets. (Godden 1972:74)

In 1866, the making of china was discontinued [by Cockson and Chetwynd, at the Cobridge works], and the manufacture of white graniteware for the American trade was substituted. (Godden 1972:36)

The decoration on some of these newer wares continued to imitate oriental designs [e.g., flow-blue handpainted decoration and gaudy polychrome and lustre patterns such as the popular "blinking eye" motif (Freeman

1954:32; Ray 1974:77) produced during the 1850s and 1860s]. After midcentury, ironstones either were left plain (Miller 1980:18) or were embellished with unpainted, molded geometric, foliate, or floral motifs (Collard 1967:18; Lofstrom *et al.* 1982:10).

Both types of ironstone discussed by Collard (1967:125–135) developed as English commercial responses to foreign competition from porcelain manufacturers: first oriental, then French. A number of English potters used names that played upon the idea of porcelain, such as “Opaque Porcelain” and “Demi-Porcelain,” which referred to what others simply called stone china or ironstone. Some manufacturers even used French names such as “Porcelain de Terre” [John Edwards and Co. trademark, 1880–1900 (Godden 1964:231)] and “Porcelain Opaque” (Collard 1967:130). No other ware had so many synonyms. In addition to the obvious “ironstone china,” popular variants included white granite, semi-porcelain, and stone china, often with several names combined on one piece (Collard 1967:131; Ramsay 1947:153). Wetherbee (1985:15) lists 61 names used to mark ironstone. To those unfamiliar with the history of ironstone after the mid-nineteenth century, this profusion of names can cause considerable confusion.

Henry and Garrow (1982b:466) propose a date range of 1840 to 1885 for heavy-bodied ironstones and identify two varieties: white-bodied and blue-bodied. [Miller (1980:18) also mentions this distinction.] These colors are imparted by actual body color rather than by the glaze, which appears clear. When sherds are viewed under a strong, even, fluorescent light, white-bodied ironstone appears stark white, while the blue-bodied variety has a slight bluish cast. Within the ceramic assemblage from the original Phoenix townsite (Henry and Garrow 1982b:466), blue-bodied ironstones tend to be undecorated and to have British manufacturers' marks, whereas white-bodied ironstones exhibit “nearly the full range of decorative techniques” and most often were the products of American manufacturers. In the Washington, D.C., Civic Center assemblages (Garrow 1982:25), white-bodied ironstones generally exhibit molded relief patterns, with panels most common on flatware forms.

If taken together, Garrow's (1982) and Henry and Garrow's (1982b) comments on white-bodied ironstones being primarily of American manufacture can be construed as contradictory if one considers the following quote:

In 1860, the [Pearl Pottery, Hanley] works passed into the hands of William Taylor, who commenced making white granite and common coloured and painted ware. But this he discontinued, and confined himself to white granite-ware for the United States and Canadian markets, of both qualities—the bluish tinted for the provinces, and the purer white for the city trade. He was succeeded in 1881 by Wood, Hines & Winkle, who produced “opaque porcelain” in all the usual services (Godden 1972:75).

It is clear that both blue- and white-bodied classic ironstones were being produced by British manufacturers. Thus, the problem appears to stem from the fact that white-bodied ironstone had a long temporal span. Early on they almost exclusively were British-made and had molded designs, while toward the end of the nineteenth century, both British *and* American potteries were producing large quantities of lighter-weight, variably decorated white-bodied ceramics.

Although Henry and Garrow (1982b:466) extend the date range for white-bodied ironstone to the present (they classify with ironstone the "semi-porcelains" advertised in mail-order catalogs from 1895 to 1927), they do not distinguish among American and British white-bodied ironstones. Wares classed as "semi-porcelain" exhibit many decorative techniques (e.g., handpainting and decal) in addition to molding and frequently were made by American potters (see below), but the *molded* white-bodied ironstones discussed in Garrow (1982) declined in popularity around 1880 and primarily were of British manufacture (see Sussman 1985:7; Majewski and O'Brien 1984:23; Wetherbee 1980, 1985). Thus, classic, heavy ironstones found on pre-1870 sites invariably are of English origin. Even after 1870, when factories in New Jersey, Ohio, and Maryland began producing ironstone in imitation of English shapes and patterns, the English product remained more popular with American consumers. Most American companies did not mark their ironstone products, except for the larger pieces such as pitchers, serving bowls, and platters. However, those that did use backmarks often blatantly imitated British coats of arms or royal garter marks in an attempt to make their products more saleable (Ketchum 1983:12).

Further refinements in white-bodied wares were, as usual, linked to changing consumer preferences. By the late 1800s the classic heavy ironstones became outdated for household use. Collard (1967:135) notes that American writers on ceramics and taste began equating semivitreous ironstone of the classic variety with lower-class status. Elliott (1878:341), for example, compared using thick, white granite cups to drinking out of a horse trough, and Prime (1878:409) expressed the hope that public taste everywhere might be elevated

if we could expel from all tables, hotels, restaurants, and private houses the white stonewares [i.e., classic, heavy ironstones, *not* vitreous hotel ware], cups a half-inch thick, and go back to such blue-and-white [transfer-printed white-bodied wares] as almost every family in the country used forty years ago [i.e., the late 1830s].

Ceramic manufacturers rebounded with several new choices.

Based on dates derived from backmarked vessels in ceramic assemblages from northeastern Missouri (Majewski and O'Brien 1984), we note that between 1870 and 1880 there was a shift from heavier, plain or molded

semivitreous ironstones to lighter-weight, molded semivitreous and vitreous white-bodied ceramics that often exhibit more delicate floral (e.g., tea-leaf and moss rose) or abstract motifs and that would become the tableware of choice in American homes well into the twentieth century (see also Freeman 1954:5).

Heavy, durable products remained on the market, however. For example, Garrow (1982:235) suggests that "hotel wares apparently supplanted white bodied ironstone in popularity," based on Ketchum's (1971:122) statement that hotel wares were introduced in the 1880s. Even if something very similar to twentieth-century vitreous hotel ware *was* introduced by the 1880s, some sources suggest that totally vitreous hotel wares did not find a market for home use until well into the twentieth century [dates cited range from the 1910s (U.S. Department of Commerce 1915:69) to the 1840s (McNamara 1948:489; Newcomb 1947:228)].

McNamara (1948:488) notes that hotel ware is a "rather unique type of ware developed and made only in the United States." The ceramic body primarily is composed of clay, flint, and feldspar that is fired to complete vitrification and then covered with a fairly hard, resistant glaze (Newcomb 1947:227). Three grades were manufactured, based on wall thickness (McNamara 1948:489; Newcomb 1947:228):

1. double thick (5/16–3/8 in.), for the most severely handled service (e.g., lunch counters, or enlisted men's Army messes);
2. single thick, rolled edge (5/32–1/4 in.), for hotel and restaurant service;
3. single thick without rolled edge (less than 1/4 in.), for "high-class eating places" and household use.

The latter usually is more elaborately decorated when made for home use.

Henry and Garrow's (1982b:466) observations on ironstone suggest, however, that undecorated, fairly thick (>0.3 in.) wares were readily available to consumers by about 1895 and frequently were purchased by the residents of Phoenix. It may have been the case that American ceramic producers were marketing the heavier wares for home use in addition to their lighter wares at that early date, depending on where the product was to be shipped. Discussions by ceramists such as McNamara and Newcomb probably are based on "normative" marketing data supplied by manufacturers rather than on actual use statistics. Or it may be that the "durable" ware referred to by Henry and Garrow (1982b:466) represents one of the late nineteenth-century semivitreous products that approached the stage of being completely vitreous.

The term *porcelain* refers to a variety of dense, highly vitreous and translucent white-bodied wares. To our knowledge, no extensive summary of nineteenth-century porcelain from archaeological contexts has yet been written, and we do not propose to remedy the situation here. Rather, we

present some basic historical and technological information on porcelain that may be useful in separating it from other nineteenth-century vitreous wares.

True, or hardpaste, porcelain contains a large portion of clay and forms one end of a continuum, with the other end represented by softpaste porcelain, which consists primarily of an opaque glass and in some cases very little clay (Grimshaw 1971:334). Grimshaw (1971:334) states that true porcelain should consist of a core or skeleton of mullite, enclosed in a fusible, silica-rich glass that binds the particles together. McNamara (1948:477–478) notes that while the composition of porcelain bodies varies because of the difference in chemical composition of the raw materials used, it does so within rather narrow limits, based on the fact that the major oxides are the same and the properties and firing temperatures depend on the ratio of the oxides. He presents a theoretical composition for hardpaste porcelain bodies based on the analysis of many porcelains, both ancient and modern: kaolin clay, 50%; feldspar (*petunse*), 25%; and flint (SiO_2), 25%. In cases where the clay and feldspar contain enough excess silica (as in the kaolins used by the Chinese), the addition of flint is unnecessary. Cornish stone is an iron-free feldspathic rock used in England in lieu of feldspar. Other, auxiliary, fluxes often are added when the raw materials do not contain natural fluxes (e.g., zinc oxide to increase the whiteness of the body).

Kaolin clays used to make hardpaste porcelain are inherently nonplastic; thus most porcelains are formed by casting in molds or by using a jiggering wheel (Rhodes 1973:43, 54). Aging is the only method known for increasing the plasticity of the body, yet even early Chinese porcelain bodies aged for as long as a century remained relatively nonplastic (McNamara 1948:482). Rhodes (1973:54) notes that it is difficult to achieve a porcelain body suitable for throwing. If sufficient ball clay is added to the body for plasticity, the fired result is cream-colored or gray rather than white.

Hardpaste porcelain usually is fired twice, though some of the early Chinese porcelain was fired only once, the glaze being applied to the dry body (McNamara 1948:476, 484). The first (biscuit) firing is at a low temperature (815–900°C) to give the body enough strength to be handled for glazing. The body is extremely porous and absorbs a large amount of the glaze. The feldspathic glazes typically used on hardpaste porcelains normally are translucent and are fused with the underlying body (Honey 1952:276–277) when fired (after drying) at very high temperatures (usually in the 1350–1550°C range). Aided by the absorbed glaze, the body completely vitrifies (McNamara 1948:476, 484).

Chinese hardpaste porcelain was manufactured as early as the Tang dynasty (A.D. 618–907), but it was not until the Ming dynasty (A.D. 1368–1644) that Chinese potters began to exploit the technical possibilities of the ware (Hughes and Hughes 1968b:16). The Chinese exported

porcelain to England as early as the fifteenth century, but little was shipped to the rest of Europe until after 1600 (Hughes and Hughes 1968b:18). Beginning in the sixteenth century, Chinese export porcelain appeared in California, Spanish Florida, Mexico, and the Caribbean (Degan 1979; Lopez Cervantes 1977; South 1982) and appears in eighteenth-century contexts on English colonial sites on the American East Coast (Noël Hume 1970:257). Many attempts to duplicate hardpaste porcelain were made in Europe beginning around 1450 (Hughes and Hughes 1968b:18), but the formula for true porcelain was not recreated until 1710 in France and 1782 in England. However, continental European production emphasized hardpaste porcelain, while softpaste porcelain predominated in England (Cotter 1968:7).

Eighteenth-century experiments in porcelain making led to the development of softpaste, or "artificial," glass-frit porcelain and bone china. The former contained a vitreous frit: a mixture of white sand, gypsum, soda, alum, salt, and a nitre melted together in a mass, then broken and pulverized. Glass-frit porcelain was fired twice at temperatures much lower than those required for hardpaste porcelain, resulting in an appreciably softer ware that was sensitive to sudden temperature changes. The end product displayed a cream or ivory white tint, to which glazing with easily fusible lead glazes gave a waxy surface (Honey 1949:5; Hughes and Hughes 1968a:125, 1968b:24-25).

The composition of the softpaste body essentially is a high-silica glass with very small amounts of crystalline material present (McNamara 1948:485). Because of a deficiency in Al_2O_3 , no mullite is present in the fired body; thus it is deformed easily during firing. Production of early glass-frit porcelains never was very profitable, as loss on firing was so great (Grimshaw 1971:335).

Bone china, first marketed in Britain by Josiah Spode during the 1790s (Hughes and Hughes 1968a:23), is a kind of porcelain intermediate in properties between hardpaste and softpaste porcelain. Although considered a variety of softpaste porcelain, it often is designated as "natural porcelain" to distinguish it from the fritted bodies (McNamara 1948:486). The high degree of translucency of bone china is attributable to the formation of a glassy material that results from combining bone ash and silica. The basic formula, standard to this day, consists of paste [bone ash (6 parts), china stone (4 parts), and kaolin (3.5 parts)] and glaze (silica, potash, and lead oxide) (Hughes and Hughes 1968a:23-24, 1968b:21).

The bone china body usually is quite nonplastic and in this respect is similar to hardpaste porcelain (McNamara 1948:486). However, the firing regimes of both fritted porcelain and bone china are more similar to those for refined earthenwares than they are to hardpaste porcelains. As noted previously, the first firing of a hardpaste porcelain body is at a lower

temperature than that of the final (glost) firing. In the case of fritted porcelain and bone china, the first firing temperature is *higher* than that of the final firing. Firing temperatures for fritted porcelain and bone china range from 1205 to 1315°C for the first firing and from 900 to 1095°C for the final firing (McNamara 1948:484, 486–487).

Whereas the majority of refined earthenwares found on nineteenth-century North American sites are British- or American-made, porcelains of this period are not so easily categorized. Possible sources include Britain, North America, China, Japan, France, Italy, Germany or Austria, and elsewhere in Europe. Until more comprehensive studies of archaeological assemblages of porcelain are made, researchers would be best served by distinguishing among the major categories based on technological characteristics of the body and decoration.

Although some English factories continued to produce glass-frit, softpaste porcelain well into the 1800s (Cotter 1968:14), bone china became the standard English porcelain body early in the nineteenth century (Collard 1967:166). American companies such as Bonnin and Morris of Philadelphia were attempting to make bone china on a profitable basis by about 1770 (Cotter 1968:7; Hood 1972), but they were unable to compete with the English product until the 1890s at the earliest (Cotter 1968:14).

If researchers are going to include bone china as a variety of softpaste porcelain (e.g., Garrow 1982; Majewski and O'Brien 1984), it must be made clear that it is not eighteenth- and early nineteenth-century glass-frit porcelain. [There are twentieth-century frit porcelains as well, e.g., Belleek and Lenox (Norton 1970:3).] Of interest, then, to researchers analyzing nineteenth-century ceramic assemblages are the visually distinguishing characteristics of hardpaste porcelain and bone china. [Cotter (1968:25), Hughes and Hughes (1968a:125–126, 1968b:21), and Ramsay (1947:156) discuss the distinguishing characteristics of early softpaste porcelain.] We examine these below.

The term hardpaste porcelain includes Chinese, Japanese, and most continental European porcelain. As Garrow (1982:236) notes, hardpaste sherds have a clear, thick, glassy glaze that is absent on the bottom of the basal ring [left unglazed so that vessels do not stick to the saggers (clay boxes used to hold porcelain utensils) during glost firing (McNamara 1948:483)]. Garrow (1982:236) also characterizes hardpaste porcelains as having a stark white [surface?] and a glaze that is neither cracked nor discolored. Sherd-break surfaces do not exhibit staining and are cleaned easily in the laboratory. He notes, however, that softpaste porcelain (most certainly referring to bone china, since the assemblages discussed in his 1982 report date to the period 1850 and after) has an ivory-colored surface. The glaze tends to crackle slightly, and sherd-break surfaces often appear discolored after prolonged contact with the soil matrix. The latter is not surprising, as

bone china is more porous than hardpaste porcelain [i.e., 0.3–2% versus 0% absorption (Watts 1939:315)].

In addition, both hardpaste porcelain and bone china are highly translucent (Newcomb 1947:223; Watts 1939:315) and tend to display flintlike surfaces when broken. Actual appearance of the paste in cross section (e.g., hardpaste being less granular than bone china) is *not* a reliable distinguishing characteristic, since pastes tend to look glassier and more granular as the amount of quartz (SiO_2) in the body increases. Most continental European hardpaste porcelains have an SiO_2 content ranging from 2.8 to 5.3%, while Chinese and Japanese examples have a much higher SiO_2 content: from 5.5 to 7.4% (Grimshaw 1971:335). Thus, a hardpaste oriental porcelain may have a very glassy, sugary appearance where broken, and a bone-china paste may appear extremely dense and fine grained. L. Sussman (personal communication) suggests a definitive test to separate hardpaste porcelain from bone china: under ultraviolet light bone china fluoresces blue-white while hardpaste porcelain fluoresces magenta.

We disagree with Garrow (1982:236) that hardpaste surfaces always are stark white. Many late nineteenth-century oriental porcelains display a rather pale gray, milky surface, similar to the earlier Chinese export porcelains (Noël Hume 1970:258). The white-surface porcelians probably are of European manufacture.

In production, the porcelain body takes up a large amount of glaze and the two fuse together during firing. Although fusion occurs, the glaze often appears to cling to the body in a translucent line on both sides (Noël Hume 1970:258). It especially is evident in oriental porcelains, which have a high SiO_2 content in both the body and the glaze. The glaze often appears to “cling” to the body on some semivitreous ironstones, but it would be difficult to confuse these with porcelain, since ironstones are *not* translucent and are thicker and have more absorbent bodies.

Few porcelain vessels were left undecorated (see U.S. Department of Commerce 1915:80–84 for comparative figures on decorated and undecorated porcelains imported to the United States from 1867 to 1913). Overglaze decoration was the most common decorative method on European porcelain before about 1880 (e.g., Garrow 1982:236). Underglaze decoration generally was limited to designs in cobalt blue, since it is one of the only colors that can withstand the high glaze-firing temperatures necessary for feldspathic glazes and still retain its clarity (Chandler 1967:106; Hughes and Hughes 1968b:22). Post-circa 1880 porcelains frequently were decorated with overglaze decal motifs in combination with gilded or embossed designs (Henry and Garrow 1982b:466). Inexpensive, highly decorated overglaze handpainted Japanese porcelains were made for export during the last quarter of the nineteenth century, intended especially for the American market (Newcomb 1947:16). These wares (especially Japanese “eggshell” porcelain) were common well into the twentieth century and often were used by companies as “giveaways” for promotional purposes (e.g., *Needlecraft Gift Book 1929–1930*).

As mentioned earlier, porcelains of varied origin might appear in nineteenth-century North American ceramic assemblages. For example, because of differing tariffs and marketing trends, Canadian import practices apparently were not the same as those in the United States. Collard (1967:189–191) notes that mention of French porcelain was not common in Canadian advertising until the 1850s, whereas in the United States it had become frequent earlier in the century. British bone china appears to have held the major market share in Canada, and probably in the United States as well, for most of the century.

Chinese export porcelain never was as popular in Canada as in the United States. However, toward the close of the Victorian period Canada shared with the western world a revival of interest in oriental wares (both Chinese and Japanese) (Collard 1967:165, 197). During the closing decades of the nineteenth century, Japanese, German, British, French, and other European porcelains were vying for shares of the popular market. A table listing the value of “china, porcelain, earthen, parian, and bisque ware, decorated, gilded, or ornamental” from 1892 to 1913 (U.S. Department of Commerce 1915:85, Table 31) shows that the major exporters of those wares were the British (until 1897, when Germany became the top exporter), Germans, French, and Japanese. Over that 22 yr period the value of French and Japanese imports continued to rise. By the end of the nineteenth century the ceramic market had attained a level of complexity unknown earlier in the century, a fact that has serious ramifications for archaeologists dealing with turn-of-the-century or mixed assemblages.

Summary

The problems involved in assigning nineteenth-century ceramic vessels or sherds to ware types, as we have stated, stem from a misconception on the part of archaeologists as to what the various wares actually represent. Pearlware is an excellent case in point, since debates over how to distinguish pearlware from other wares have been played over and over in the ceramic and archaeological literature (e.g., Lofstrom *et al.* 1982; Mankowitz 1953; Price 1979; Sussman 1977). Pearlware was introduced by Josiah Wedgwood in 1779 as an alternative to creamware, which was beginning to lose its appeal to consumers (Miller 1980:16). The new product was whiter than creamware, but it also exhibited a blue cast, similar to the color of porcelain. This was no accident (see Miller 1980) but rather an attempt to fill a void in the porcelain market left by constantly rising tariffs on Chinese porcelain (Haggard 1972:185). Almost all of this new bluish tint, white earthenware was decorated, much of it with oriental-looking transfer prints, and often was marketed under a plethora of names such as “China Glaze” and “Pearl China” (Godden 1964; Miller 1980; Noël Hume 1969a).

Curiously, a race later developed among English potteries to whiten even further the look of their nonvitreous earthenware (pearlware). Perhaps, as Miller (1980:17) suggests, this was in response to the introduction of bone china in the late eighteenth century and its subsequent popularity. In any event, the Wedgwood factory began producing it by 1812 to meet the rising demand and to keep their customers from turning to other factories for the product (des Fontaines 1977:135–136). Hence, “With the new taste being for a whiter porcelain [bone china], it would follow that blue tinted pearlware was subject to pressure to copy the new porcelain” (Miller 1980:17).

Given the amount of activity that was dedicated to finding a method for whitening nonvitreous earthenwares (Delhom 1977 lists six formulas for pearl body used in the Wedgwood factory between 1815 and 1846), it is not surprising that archaeologists often are hard pressed to distinguish among early to mid-nineteenth-century wares. Miller (1980:2) sums up the problem adequately:

If an assemblage of ceramics from the first half of the 19th century is placed before six archaeologists and they are asked for counts of creamware, pearlware, whiteware, and stone china wares, the results will probably be six different enumerations. The question of how much blueing the glaze has to have before it is pearlware or which sherds have the density to be classified as stone china all hinge on personal opinions.

This lack of agreement is not confined to archaeology, nor is it confined to materials from the nineteenth century. If, as Newcomb (1947:222) stated, “There is a great deal of confusion and ambiguity in the terms used in the [ceramics] trade, especially among retailers and consumers,” as well as among manufacturers (see second opening quote to this chapter and Barringer 1951), how can archaeologists hope to create internally consistent ware groups? The answer is, with the data at hand, they cannot. Unfortunately, this is a long-standing problem, for as Barringer (1951:15) notes: “I have been asked, for instance, by historical and archaeological interests for a ceramic nomenclature which could be used in the literature of such technical groups but have reluctantly replied that as yet we [the American Ceramic Society] have nothing official.”

Perhaps the breakthrough in this problem will come with detailed examinations of various aspects of the technological processes (as discussed earlier) that constantly were being developed during the nineteenth century and then linking the resulting data with individual company records and production information. Several immediate problems with this approach come to mind, not the least of which was the secrecy that may have cloaked technological experimentation and ceramic production. While Collard (1967:125–126) states correctly that “little was done in Staffordshire that was not immediately known to everyone else” (including other Staffordshire potters), what she is referring to is the final product, not necessarily

how the product was produced. As a case in point, consider Josiah Wedgwood, who was one of the foremost “scientific” experimenters in the development of eighteenth-century ceramic technology. Wedgwood’s contemporaries, such as Spode, Minton, and Adams, and his successors from 1795 onwards (with a few exceptions), relied mainly on the inventions of others and on patents that ultimately came on the market. Potters also had to be wary of pirates who copied their patent processes or their designs and special wares (Thomas 1971:27–28).

Given the almost endless number of English and North American potteries that were producing ceramics during the nineteenth century, it would appear to be an impossible task to compile the data we are suggesting. However, there may be several ways to approach the problem that could provide useful starting data. For example, ceramic pieces that can be tied to manufacturer and date of manufacture by backmarks (see later sections) could be subjected to any number of nondestructive tests (e.g., the measurements of hardness and water absorption discussed earlier) as well as to destructive examinations (e.g., shock and stress measurements, X-ray defraction, microprobe analysis, and thermoluminescence) to compile a catalog of technological data that eventually could be useful in examining spatial and temporal trends. We have no way of knowing at this point, but it may turn out that (1) for certain dimensions (e.g., body composition, degree of vitrification, and porosity) there are values that cluster tightly around a mean regardless of where a vessel was manufactured, and (2) the mean values changed significantly through time. However, the problem remains to measure dimensions such as degree of vitrification on archaeological specimens and then to match the results against standards of known date and place of manufacture. This obviously is a time-consuming and expensive endeavor, but it may be the only solution to the problem.

As a first step in this direction, we have offered a brief discussion of nineteenth-century ceramic technology. It is well beyond the scope of this chapter to detail all the angles pursued by nineteenth-century manufacturers in their search for the “perfect” body. Rather, we concentrated primarily on several factors that allow earthenwares to be classified under the headings nonvitreous, semivitreous, and vitreous. At the very least, the discussion should result in a wider appreciation for the complexities of nineteenth-century ceramic manufacturing as well as for the problems faced by manufacturers in their constantly changing efforts to create new ceramic bodies.

Decoration and Decoration-Based Categories

Miller (1980:18), as we have pointed out, takes a dim view of ware-based systems of categorizing nineteenth-century ceramics and states that:

Beyond chronology, there are few, if any, reasons to organize ceramics by ware types. Interpretation and synthesis of archaeological data with historical sources will be greatly facilitated by organizing ceramics according to their form and the decoration they bear. For example, it makes little sense to separate shell edge plates into creamware, pearlware, and whiteware.

The reader will recall from previous discussions of pearlware that during the late eighteenth and early nineteenth centuries, ceramic manufacturers were attempting to offer a relatively inexpensive porcelain substitute, and to make the ware commercially attractive they had to decorate it in a somewhat similar fashion to porcelain. Transfer printing became a popular method of decorating nonvitreous and semivitreous earthenware, with the most widely used designs being pseudo-Chinese (*chinoiserie*) motifs. Thus, despite differences in glaze and paste composition, the main thrust of manufacturing was to create an oriental-looking vessel, and the primary method of achieving this look was through appropriate decoration. If this premise is accepted (i.e., that style exists independently of ware type), then we can begin to use decoration to examine manufacturing-, marketing-, and consumer-related issues, topics that ware-based systems of categorization cannot readily address.

As a substitute for ware-based systems of categorization, and because of his interest in investigating economic- and status-related issues, Miller (1980) examined nineteenth-century price-fixing lists, account books, bills of lading, and newspaper advertisements to determine how ceramics were marketed. He devised a four-level classification scheme arranged in ascending order by consumer cost:

1. undecorated vessels, almost always referred to as cream-colored (CC), at least during the first half of the nineteenth century (see below);
2. minimally decorated ceramics (showing a low level of expertise) such as shell edge, sponge-decorated, and dipped (annular-decorated) vessels;
3. handpainted vessels with slightly more intricate, standardized patterns such as flowers, leaves, and stylized Chinese landscapes;
4. transfer-printed vessels (Miller 1980:3-4).

During the nineteenth century, ceramic prices declined at a faster rate than did commodity prices in general (Miller 1980:15). Undecorated cream-colored vessel prices were fairly stable, however, and provide a useful scale against which to measure changes in the value of other decorative types. Using the documented prices of these vessels, Miller created "CC-index values," which can be used to calculate the relative cost above that of cream-colored vessels for vessels from both archaeological sites and probate inventories, allowing assemblages to be scaled in terms of expenditure on ceramics.

Miller's scheme has enjoyed wide usage (e.g., Cheek and Friedlander n.d.; Garrow 1982; Henry 1986, n.d.; Henry and Garrow 1982a,b; Klein and Garrow 1984; Spencer-Wood n.d.a,b), in part because it is a classification system that actually *measures* variability in an archaeological assemblage as opposed to simply categorizing the components of the assemblage. The system appears to work well for the first half of the nineteenth century, but as Miller (1980:3) notes, fairly expensive white-bodied wares, marketed under such names as stone china and white granite ware, entered the picture around 1850 and in Miller's system would be placed in his lowest level because they often were undecorated. In terms of cost, however, these vessels should be placed in a fifth level, above that for transfer-printed vessels. Jacobs (1983) makes such an adjustment in generating a socioeconomic perspective on the ceramic assemblage from the Butler's Barracks complex, Niagara-on-the-Lake, Ontario.

Miller's price indices are incomplete for the period after 1870, and they end in 1881. In their examination of ceramics from Phoenix, Arizona, Henry and Garrow (1982a,b) extend Miller's indices through 1927 by studying retail ceramic prices listed in mail-order catalogs from several large firms. Their system deviates from Miller's scheme in that they use retail prices as opposed to wholesale prices, but our perusal of various catalogs published around the turn of the century support their claim that "ceramic prices continue[d] to be linked with various decorative techniques" (Henry and Garrow 1982a:323). For example, the 1906 edition of the Sears, Roebuck & Co. catalog (pp. 354-56) lists several hundred-piece sets of dinnerware ranging in price from \$4.40 to \$6.98. The most expensive set was decorated with underglaze transfer-printed designs and cost a dollar more than a gold-trimmed set that contained a similar edge motif (although not stated in the description, this motif probably was either stenciled or decaled), \$2.29 more than a decaled set, \$2.58 more than an overglazed stenciled set, and \$2.63 more than a "plain white" set.

Despite their ability to measure variability in an assemblage—variability that might be tied directly to differences in status, economic position, or ethnicity—decoration-based systems are not without their potential drawbacks and limitations. First, there is the problem of what to do with the undecorated vessels and those that have at most a band of unpainted relief decoration around the rim or a small amount of body molding. In our discussion of Miller's quadripartite scheme we noted that the popularity of semivitreous white-bodied wares (ironstone) after 1850 alters the scheme, and another level must be added for post-circa 1850 assemblages. Thus, a researcher must be able to separate cream-colored (CC) vessels from ironstone vessels, both of which frequently occur undecorated. This often is not too difficult a task, especially if an established type collection is used and if vessel form can be identified (Miller 1980:3 notes that post-1820 CC

vessels have a range of forms limited mainly to items such as bedpans, kitchen bowls, and chamber pots). As discussed earlier, the real problem involves sorting out the various semivitreous and later vitreous white-bodied wares that were manufactured during the nineteenth century. Physical-chemical analyses of the kind suggested previously will go a long way toward producing replicable results, but for the present, attention to paste color, paste hardness, and perhaps vessel form will allow finer distinctions to be made among white-bodied wares.

Second, although ceramic sets as well as individual pieces were marketed by decoration throughout the late nineteenth and early twentieth centuries, they *also* were marketed by ware or by pattern (cf. Henry and Garrow 1982a:323). Our perusal of the 1906 Sears, Roebuck & Co. catalog turned up the following "names" of dinner sets: "plain white," "semi-vitreous," "Hampshire" (termed in the catalog a "high grade semi-porcelain"), "Arbutus" ("light and thin"), "floral border" ("good quality English ware"), "Rosemere," "Florence Rose," "English semi-porcelain," and "Gold Wreath." Thus, although there appears to be a relation between decorative method and price (see earlier discussion), there also may be a strong correlation between type of body and price. This question is in desperate need of an answer.

By way of summary, we agree with Miller's (1980) assertion that ware-based systems of analysis are useful for examining several aspects of pre-1800 social and economic networks. We also agree that his scheme for classifying nineteenth-century ceramics by decoration is quite workable, especially for ceramics from the first half of the century. For ceramics from the second half of the nineteenth century, however, especially given the popularity of undecorated whitewares after midcentury, we would argue that a sound knowledge of post-1850 pastes and glazes is vital.

We would also contend that more than a passing knowledge of pattern names is needed, since during the second half of the nineteenth century mail-order catalogs (some running well over a thousand pages) became common, which allowed merchants to advertise a wide variety of ceramic items and accelerated the use of pattern names to describe sets of vessels. It could be argued that all one needs to know is the range of variation in vessel shape, since different pattern names often were applied to vessels of similar shape but with different decoration. This probably works well with decorated pieces but perhaps not with undecorated pieces.

Where does this leave us vis-à-vis using decoration-based versus ware-based systems for categorizing nineteenth-century ceramics? The obvious answer is to use the system that is most appropriate for addressing a particular problem, but this response obscures the points we have been trying to make. For ceramics from the first half of the nineteenth century, there is considerable redundancy between ware-based groups and Miller's (1980)

decoration-based classes, and for the investigation of most anthropological problems we can relegate wares to a minor role. For later materials we suggest using a hybrid approach, since decoration alone cannot necessarily be used to place sherds either temporally or on a pricing scale: a point that we clumsily understated elsewhere (Majewski and O'Brien 1984). For assemblages that span the nineteenth century, or at least span several decades on both sides of the midcentury mark, or in cases where the analyst is inexperienced and cannot readily place an assemblage in time, both decoration and ware become important elements of analysis. This admittedly may not be the most satisfactory solution, but at this point it appears to be the most expeditious approach.

To use a decoration-based system requires a working knowledge of the ways in which pottery is decorated, but such a system is fairly straightforward and easy to learn and does not contain the internal inconsistencies that many ware-based systems exhibit. As an example of one kind of decoration-based system, we examine the scheme used to organize ceramic material from five sites located in the central Salt River valley of northeastern Missouri (Majewski and O'Brien 1984; O'Brien 1984). The sites, rural farmsteads that were first occupied between 1830 and 40, contained materials that dated as late as 1970, but only porcelain and refined earthenwares manufactured before about 1920 were examined. We do not claim that the assemblages contain the entire range of English and American ceramics manufactured during the nineteenth century, but based on our examinations of the literature on contemporary assemblages excavated in the midwestern and eastern United States and in southern Canada, we suggest that the classification system is fairly encompassing.

The system could, in a relaxed sense of the word, be termed a taxonomy. It is a hierarchical system based on levels of decisions that nineteenth-century potters made in deciding if a vessel was to be decorated and if so, how (Figure 1). This statement is a bit misleading, since the potters were not making the decisions; the *companies* that employed the potters made the decisions, based on their assessments of consumer desires, manufacturing costs, and a host of other factors. We do not suggest that the system is capable of addressing all these issues. Rather, we use it here as a framework around which to discuss various methods of decorating ceramics. As mentioned earlier, several grouping or classification schemes need to be used sequentially to answer different research questions. The system does, however, point out the intricacies of vessel decoration and can be used to examine the levels of decorative complexity constructed by Miller (1980).

The first decision facing a potter is whether to decorate a vessel or to leave it plain. As most refined earthenwares designed for use as tableware are moldmade, the choice of surface shape (unmodified versus modified) is made at the beginning of the production process. Creating an unmodified

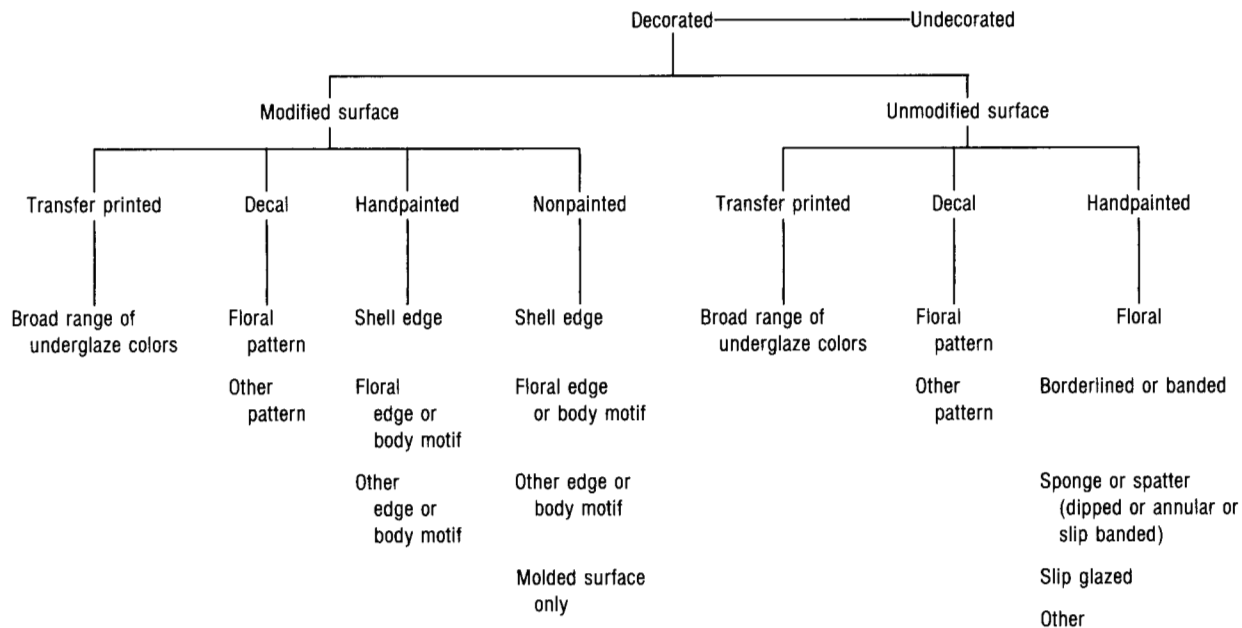


Figure 1. Taxonomic system used in the historical-ceramics classification.

surface is in itself a decorative choice, as is the option of including negative or positive relief decoration along the rim, on the body, or on the pedestal. What we term relief decoration is referred to as "molded" by Price (1979), "embossed" by Ketchum (1983), Lofstrom (1973), and Steinacher and Carlson (1978), and "raised" by Worthy (1982). [The taxonomic system outlined here has been modified since our original presentation (Majewski and O'Brien 1984).]

Cotter (1968:28) lists the various ways in which relief decoration is produced: (1) by freehand modeling or by free incising and piercing; (2) by pressing soft clay in molds; (3) by casting; (4) by impressing the surface of soft clay objects with metal or other stamps cut in intaglio; and (5) by molding low reliefs separately and applying them to the surface of the vessel with a slip. The types of relief decoration we categorize under "modified surface" generally are produced as in types 2, 3, or 5.

Once a potter decides whether to create a relief decoration on a vessel, the choice of how to apply further decoration is open. Nineteenth-century potters appear to have had three major choices: to transfer print the vessel; to handpaint it; or to leave it plain. (The use of decals began very late in the nineteenth century.) Occasionally a vessel was decorated by a combination of methods, and under our system the researcher must decide which features are primary and which are secondary. For example, a vessel with a modified surface consisting of a relief-decorated, handpainted edge and a decal decoration on the body would be classified under "modified surface, handpainted edge," with the decal noted as a secondary feature. In this case we would consider that the relief-decorated portion of the vessel was molded and probably even fired prior to application of the handpainted detail or decal decoration and thus should be considered as a primary feature.

Our method of categorizing the primary feature when a combination of decorative methods were used differs substantially from the "dominant motif analysis" concept suggested by Henry and Garrow (1982a:293). Their approach involves using the most technically complex motif present on a sherd as the motif descriptor. They do not distinguish between relief-decorated sherds without color decoration and plain sherds, since "molding and/or embossments normally do not extend over more than a small part of any given vessel." They categorize the following motifs according to increasing level of complexity: gilding used alone; luster, tinted, and colored glaze (primarily a twentieth-century technique); handpainted decoration; and transfer-printed, decal, and flow decorations. We argue that a more objective, replicable assessment of primary versus secondary decorative features can be made if one considers as primary those features that are *structurally* primary, that is, relief decoration, since it occurs earliest in the vessel construction sequence, then underglaze decorative techniques such as transfer printing and handpainting, then decoration expressed as overall glaze

coloration, and finally, decoration applied over the glaze, such as decals and handpainting or gilding.

There are a few other points about the hierarchical system that should be made. First, three of the four features shown in Figure 1 under "modified surface" (transfer printed, decal, and handpainted) categorize the secondary decorative treatments accorded vessels already exhibiting some form of surface relief. The fourth feature (nonpainted) refers to unmodified relief decoration as a primary feature, that is, relief that is not decorated further, as in the case of hollowware and flatware forms with fluted, paneled, or ribbed molded rims or sides.

Second, there is *no* equivalence between handpainting on vessels with modified surfaces and handpainting on vessels with unmodified surfaces. Handpainting on vessels with modified surfaces usually occurs exclusively on vessels that have relief areas around the rim, that is, on edge-decorated vessels. The portion of a vessel exhibiting relief usually is the only area painted, almost invariably in shades of blue or green. On vessels with unmodified surfaces, several methods of handpainting can be used. Although there is a slight degree of nonequivalence among the features listed under the category "unmodified surface, handpainted" (e.g., "floral" is a design and "sponge or spatter" is a method of applying paint), we believe the features adequately represent variability and are identified easily. Because of the significant differences in handpainting vis-à-vis vessels having modified and unmodified surfaces, we divide our discussion accordingly. Third, for ease of presentation our discussion of transfer printing and decaling does not differentiate between vessels with modified or unmodified surfaces. With these points in mind we turn to the decorative categories after a brief discussion of color considerations in ceramic decoration. After defining each category, we summarize data on methods and techniques of application, geographic areas of production, temporal ranges of the categories, and variation within categories.

Color Considerations in Ceramic Decoration

The basics of ceramic color preparation and application encompass four general areas: (1) composition of the color, (2) composition and properties of the fluxes used, (3) the medium used to apply the mixture of color and flux, and (4) the methods of glazing and firing used. To present the amount of information necessary to cover adequately each of the above topics is not feasible in this chapter. We will, however, touch on the aspects of color technology that relate directly to the decorative categories discussed in the following section of the chapter. Our discussion of color considerations in ceramic decoration is based on Caiger-Smith (1973), Muller (1985), and Shaw (1968).

Nineteenth-century potters understood the basics of ceramic color composition and preparation, and the empirical knowledge accumulated during this period formed the cornerstone of modern color technology. However, color manufacturing rapidly became the realm of a limited number of specialists who jealously guarded their knowledge. Beginning as early as the first decades of the nineteenth century, potters were purchasing ready-made color preparations, a situation that still prevails in the modern ceramic industry.

Metallic oxides constitute the basis of all vitrifiable colors. Certain oxides (e.g., mercury and arsenic) are highly volatile and are unsuitable for use as ceramic stains that subsequently will be fired at high temperatures. Others are unstable and may produce a variety of colors depending on the firing process. Early color makers were aware of this and also appreciated the necessity of adjusting flux compositions for each individual color. We believe that the easiest colors to control (e.g., cobalt blues) were used first, and as knowledge of the color preparation, application, and firing processes progressed, more colors were added. A quantum leap occurred during the late 1820s when the color palette for underglaze decoration expanded from blue to include other colors such as shades of green, yellow, red, and black. Both Lofstrom *et al.* (1983:8) and Price (1979:15) note that the expansion of the underglaze color palette may have been related to the development of a leadfree glaze sometime between 1820 and 1830, but as we noted earlier, the two events are not related. Instead, we believe that during this period many aspects of color technology became better understood (e.g., flux compositions and application and firing requirements for each color), thus allowing more colors to be used.

A list of probable metallic oxides used during the nineteenth century is fairly short (discussion is based on Caiger-Smith 1973:224–225; Shaw 1968; U.S. Department of Commerce 1915:186). It is common knowledge that cobalt compounds have been used to produce overglaze and underglaze blues in varying shades for centuries because of their stability and brilliance at high temperatures. (Shaw 1968:3 notes that cobalt was introduced in the Staffordshire potteries *ca.* 1750). Manganese was used to create aubergine purple, but also produced earth brown and purplish-brown tones.

Used alone, iron oxide is unstable. However, successful underglaze brown colors are achieved by combining chromium, iron, and zinc. By adding manganese oxide and cobalt oxide to iron–chromium browns, the potter can produce black colors. (Production of stable blacks that do not show a green, blue, or brown tint on firing mainly depends on the type of glaze or flux used in their application.) Grays can be made by diluting black stains, but the resulting colors often are unstable; that is, one of the coloring oxides (often the cobalt) predominates.

Orange and red overglaze colors can be achieved with iron compounds, but the most stable red, pink, and lilac shades come from chromium–tin

combinations. The addition of calcium oxide increases the redness of the stain and permits the development of the stain at lower temperatures. Borax, bismuth, lead, and alkalis can be added to modify the tint. Borax yields the red color but in large amounts changes it to lilac (more than 1% borax can yield a gray tint). Alkalis tend to bleach the color and are capable of developing yellow shades. Yellow is produced by fluxing antimoniate of lead (Naples yellow) with a lead frit or by combining vanadium oxide with iron compounds. Yellow shades were not used frequently in nineteenth-century underglaze decoration, probably because of the instability of the compounds involved or their high cost. The basis of most common underglaze green stains is chromium oxide. Copper oxide is volatile but also produces a transparent green.

Shaw (1968:80-81) notes that lusters constitute a form of decoration consisting of thin metallic oxide films deposited on the surface of a ceramic vessel. Upon firing, the luster effect appears spontaneously without further processing. The effect is due to the interference of incident and reflected light. As Honey (1952:383) notes, the thinner the film the more iridescent it will appear. (Lustered iridescent surfaces should not be confused with iridescence caused by glaze decay or by the excess of lead in a glaze.) Colors range from copper, gold, silver, and mother-of-pearl to shades of pink and purple (Honey 1952:383; Hughes and Hughes 1968a:103-106); Shaw 1968:63). While the noble metals are used in luster preparations, a more common use is in gilding, stenciling, and stamping (see discussions of gilding and slip glazing in subsequent sections).

Color decorations can be done under, over, or in the glaze and can be applied in various ways, ranging from handpainting and transfer printing to decaling. Successful handpainting of intricate designs requires considerable expertise, since the colors generally change during firing, and one must consider how they will blend after they have been through the enameling kiln rather than how they blend in the raw state. In overglaze handpainting, for example, the different maturing temperatures of the various colors used must be considered. It often is necessary to apply one color, enamel fire it, apply the next color, fire it, and so on.

Underglaze decoration has the advantage of being completely protected from wear by the glaze but the disadvantage of limiting the range of colors that can be used. This is because underglaze colors must be subjected to the full maturing temperature of the glaze, and the higher the temperature the greater number of coloring compounds that will burn out, react with the glaze, or even dissolve in it. Thus the range of available underglaze colors is narrowest with the feldspathic glazes used on porcelain and widest with fritted glazes (e.g., lead borosilicate) used on nonvitreous and semivitreous earthenwares.

As painting raw oxides directly onto the ceramic body would yield unsatisfactory results, underglaze coloring compounds first are calcined with a

substance such as feldspar or china clay, and the mixture is then ground to a very fine powder. (Calcination involves heating the mixture of colorants, dilutants, and fluxes that make up ceramic stains to develop the color, render the mass inert, and remove any gaseous compounds that may evolve and spoil the color.) Oil-based colorant mixtures with additives such as tar, gum, and resin are used in underglaze transfer printing. A mixture of turpentine and fat oil is the usual medium for underglaze and overglaze handpainting.

Compounds used for overglaze colors are mixed and ground with frits containing a high proportion of soft fluxes (e.g., lead, soda, and potash), since they must soften at much lower temperatures (i.e., the already glazed ware has only to undergo a low-temperature enamel firing to fix the color). Overglaze decoration greatly extends the ceramist's palette but is much less durable than underglaze decoration.

Transfer Printing

Transfer printing first was used shortly after 1750, and it is one of the few uniquely British contributions to ceramic technology (Little 1969:13). Its popularity probably was one reason why the ceramic industry switched from production centered around the marketing of wares to a strategy in which decorative technique became important. The earliest transfer prints were simple overglaze designs in black, brick red, and various shades of brown and purple. After the print was applied to the glazed surface of a vessel, the vessel was refired at a low temperature to fix the design (Hughes and Hughes 1968a:150).

Wyman (1980:187–188, 199) believes that two main methods were used in early transfer printing and that variations in these methods were implemented to suit different materials and to give different effects. One required that the coloring pigment be carried in an ink (one-step inking process), and the other required that the color be applied in a powder form upon a print done first in oil (two-step-inking “bat” process). He believes both techniques originally were cold processes (i.e., the copper engraving plates were *not* warmed first) and that the “hot” method principally was developed by the underglaze blue printers and became the dominant process after about 1780. In the hot process, paper is used to take an impression from the warmed copper plate, while in the two-step cold process *glue bats*, soft, flexible slices of a rubber- or gluelike substance, are used to take the impression. The glue bat method produces prints that are “remarkably clear and fine.” The transfer-printing process summarized below refers to a modified hot process in use by underglaze printers after about 1800.

The transfer-printing process involves several stages. Thin, engraved, warmed copper plates are coated with viscous ink (Coysh 1974:7) or a stiff

paste (Little 1969:19) formed by mixing various metallic oxides with powdered flint or other fluxes (e.g., Barbadoes tar) and oil. The ink or paste is removed with a palette knife, and the surface is cleaned with a pad or boss. Thin sheets of strong, nonabsorbent tissue paper are laid over the design and pressed against it to obtain a clear impression of the engraving.

Shading and other effects were produced through a series of close, parallel lines and crosshatching. On early underglaze prints the detail often was blurred or smudged, and large areas of the design were left open. The engraved lines on the plate were cut thick to allow sufficient color to be transferred to the printing paper. After the quality of the paper improved, thinner, more deeply cut lines were used. The greatest improvement came in the early 1800s with the combination of line-and-stipple engraving. Honey (1952:622) notes that toward the end of the eighteenth century bats were used instead of paper for taking impressions of the stipple engravings, which largely replaced linework in overglaze and underglaze printing. Fine-tone color gradations and shading then were possible. Concurrently, a strip method was developed for transferring continuous border patterns of repeating designs (Little 1969:18).

After the transfer paper is removed from the copper plate and trimmed, it is applied to an unfired ceramic body. A flannel rag is rubbed over the paper, causing the oil-bound color to adhere to the vessel surface. The vessel then is immersed in water to facilitate removing the tissue paper. If the print is underglaze, the ceramic body is given a preliminary firing at a low temperature to dry out the oil and "harden on" the color (Hughes and Hughes 1968a:149-159; Little 1969:18-19). The vessel then is dipped into glaze prior to being fired at high temperatures in a glost oven.

According to Little (1969:15-16), underglaze blue printing on porcelain was in use at Worcester by 1760, but the same technique was not applied to earthenwares until about 1780, when Thomas Minton, an apprentice engraver from Caughley, Shropshire, designed the now-famous willow pattern. By the late 1780s, the leading Staffordshire potters had begun to lure skilled craftsmen away from Caughley and elsewhere. Before long, Staffordshire Blue earthenwares were the mainstay of the district. The period 1820-1840 was one of peak production for blue underglaze transfer-printed wares, though by the 1820s their popularity was waning rapidly as new colors, including flow(n) blue (discussed later), were introduced around 1840 (Collard 1967:117-118; Lofstrom *et al.* 1982:9, 14; Miller 1974:201; Price 1979:22).

In 1828 potters discovered that green, yellow, red, and black designs could be applied underglaze without distortion by mixing the finely powdered enamel colors with Barbadoes tar (Hughes and Hughes 1968a:151). Underglaze transfer printing rarely was used on bone china and

hardpaste porcelain because underglaze colors other than blue could not withstand the extreme firing temperatures required for these highly vitreous wares (Franklin and Forrester 1975:143). Flow decoration was produced by firing the vessels in an atmosphere into which volatile chlorides were introduced. The color of the printing (or painting) spread or flowed into the glaze, creating the much-admired blurred or misty look. A deep blue was the most popular color, but other colors were used, including flow mulberry [a shade of purplish-brown (puce) or purplish-gray]. Printed wares with the flown effect also were produced in black, yellow, brown, and green. Ironstone was the favorite medium for this decorative technique (Collard 1967:118; Gaston 1983; Mason 1982), and production of the flown effect actually may have been facilitated by the more vitreous character of the ceramic body.

Mason (1982:10) notes that collectors of flow blue divide the period of its production into three phases: early (*ca.* 1835–1850), middle (*ca.* 1850–1870), and late (*ca.* 1880–1900). Although she does not detail the characteristics of flow-blue pieces from each period, researchers attempting to use flow-blue vessels as temporal markers should familiarize themselves with the diagnostic features of these periods, which include characteristic surface configurations involving motif and shape preferences and the presence or absence of overglaze gilding.

Multicolored transfer prints, which required separate color applications and firings, appeared about 1840 (Godden 1963:115; Honey 1952:622–623). A process in which blue, red, and yellow could be fixed from a single transfer with only one firing was invented in 1848, and brown and green were added to the repertoire in 1852 (Hughes and Hughes 1968a:151). Lofstrom *et al.* (1982:9–14) date transfer prints having handpainted detail to the period 1840–circa 1860. Some of this decoration is quite crude and appears unrelated to the printed design underneath.

Before 1830 border patterns were specific to particular potters and often can be identified by the style of the design (Hughes and Hughes 1968a:149, 151; Little 1969:31) (see Figure 2a). Borders on transfer-printed vessels produced after 1830 generally are not indicative of specific craftsmen and for the most part consist of undistinguished floral or abstract patterns (see Figure 2b).

The engraved designs on transfer-printed sections of vessels, apart from the borders, tended to be anonymous and were copied widely among potters. Often, many different designs were used to decorate pieces of the same set (Little 1969:22, 24). After Chinese-style motifs declined in popularity, scenic themes such as classical and romantic pastoral landscapes that reflected the tastes of the Romantic movement were borrowed from travel books or from books of engravings and paintings (e.g., the “grand tour”

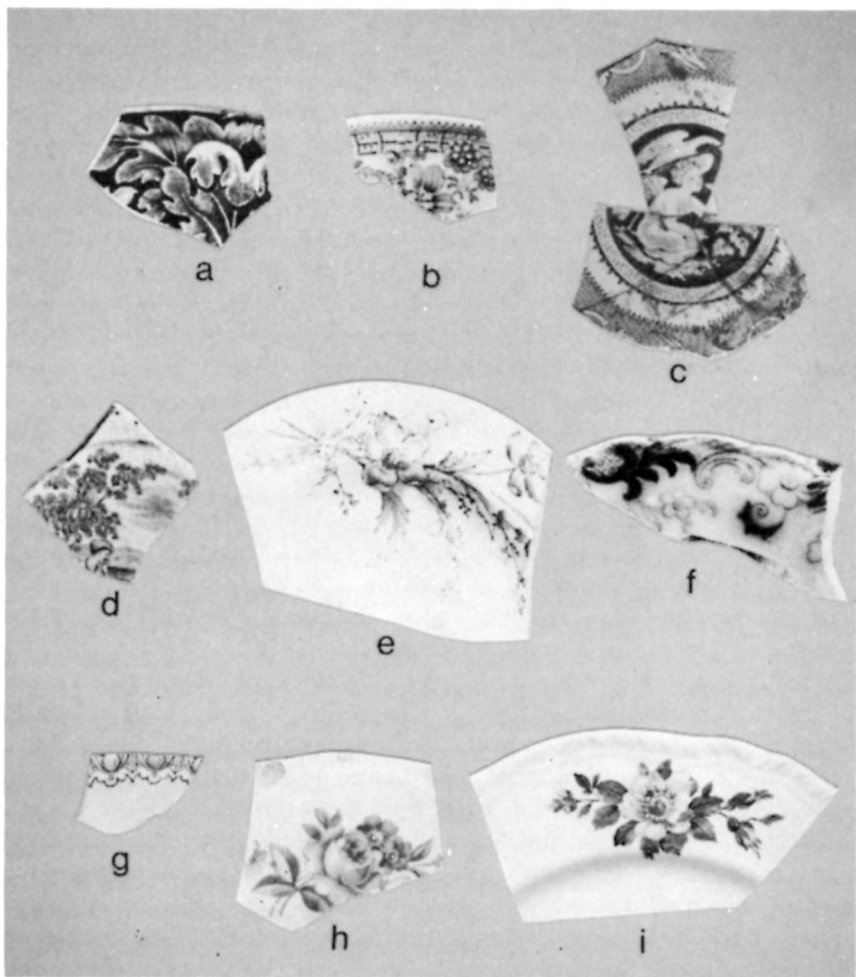


Figure 2. Transfer-printed and decal-decorated sherds (all examples from sites in Monroe County, Missouri, or from private collections, at one-half original size): (a) oak leaf and acorn border motif (probably attributable to Ralph Stevenson); (b) abstract and floral transfer-printed border design dating post-1830; (c) classical transfer print; (d) romantic transfer print; (e) revival transfer print, floral design with handpainted accent; (f) flow-blue floral transfer print; (g) border accent transfer print in Art Deco style with handpainted detail; (h) rose decal decoration; (i) floral decal on a relief-decorated vessel.

series, cf. Dyson 1982:367, 376–377) (see Figure 2c,d). Dyson (1982:366) classifies the blue-and-white transfer-printed pearlwares excavated from historical period contexts in Middletown, Connecticut, into two major categories: Chinese and Romantic. The former were popular before 1820 and the latter in the 1820s and 1830s. At the beginning of the nineteenth century,

pictures of American buildings and scenery and portraits of patriotic figures were produced for the American market (Little 1969:25–26). Spargo (1926:98) claims that after the Revolutionary War, English manufacturers produced wares displaying patriotic themes as a strategy to recapture the American market. Sussman (1979) documents the developmental sequence of Spode and Copeland transfer-printed patterns at 20 Hudson's Bay Company sites in western Canada and the United States, illustrating how one company met changing consumer tastes. Arman and Arman (1974, 1977) also provide valuable information on pattern identification.

Although it rarely is possible to date a piece exactly, transfer-printed vessels can be dated in a general fashion by their colors, which rode waves of popularity, and more specifically by identifying manufacturers' backmarks (discussed later) and border designs. As noted above, blue achieved tremendous success as the first color used in underglaze printing. Little (1969:34) states that throughout its history, blue-printed ware was produced in every conceivable shade of the color, though the most popular early blue was the deep cobalt shade. By 1830 the English market for deep blues was saturated (Shaw 1970:234–235), and other colors became popular. Collard (1967:117–118) notes that:

The potters of England had an answer for this new problem . . . they learned how to produce wares in brown, pink, lavender, green, orange, grey and new light blue—never to be mistaken for the older, sparkling blue . . . or the deep, sapphire blue. . . . The paler shades had appeal of their own, and the details of the engraving often tended to be clearer.

Shaw (1970:234–235) documents the appearance of red, brown, and green transfer prints in England by 1828, and Lofstrom *et al.* (1982:14) suggest an ending manufacture date of 1850 for these three colors. There was, however, a revival of these colors on late nineteenth-century “revival transfer-printed” vessels (Henry and Garrow 1982a:300; see also Herzkovitz 1978), and they apparently lasted into the early twentieth century (Henry and Garrow 1982a:300). Vessels from this later period usually do not have the scenic views or cottage views seen on earlier transfer-printed vessels (Garrow 1982:234); rather, they exhibit monochrome floral motifs around the rim or occasionally over the entire vessel (Figure 2e). Revival transfer designs often are found in combination with gilding and molded designs and infrequently are enhanced by handpainted detail (Henry and Garrow 1982b:468). Black transfer prints were popular from 1830 to 1860 (Lofstrom *et al.* 1982:9). As mentioned earlier, flow transfer prints, in which the pigment bleeds into the surrounding glaze, were introduced about 1835 and continued to be popular in various forms throughout the nineteenth century (Figure 2f).

Transfer-printed vessels generally have a regular circular lip form, though transfer-printed vessels that also have raised border designs usually have scalloped circular lip forms. The latter combination meant more work

for the pattern cutter, who had to cut a print to fit the scalloped edge. The temporal significance of the scalloped circular versus regular circular lip form on transfer-printed vessels is not entirely clear.

Price (1979:19) notes that through time, transfer-printed designs became less complex and tended to occupy less and less of a vessel surface. By the late 1800s, transfer prints were limited to occasional use as border accent designs (cf. Garrow 1982; Henry and Garrow 1982b) (see also Figure 2g), and their use eventually was superseded by decal decoration in the early twentieth century (Wegars and Carley 1982:7).

Decal Decoration

During analysis of late nineteenth-century and later assemblages, one often encounters decal-decorated ceramics. Decalcomanias or decals, also called transfers, are designs printed on film or paper that are applied to ceramic surfaces. Decals often are confused with transfer prints (e.g., Ketchum 1971:121) but can be distinguished from the latter by the sharp lines of the design, the presence of shading in the colors, and the use of bright, clear, natural colors (Henry and Garrow 1982b:468) (see Figure 2h-i). We also have noted that one can feel slight relief when touching the edge of a decal design.

Newcomb (1947:199) discusses both monochrome and polychrome decal production. When the decal design is done in a single color (e.g., for trademarks, crests, and insignias), the original design is engraved on a copper plate. The ceramic color is ground finely and mixed with oil and then is worked into the engraving with a rubber blade. A sheet of thin, strong paper is laid over the engraving, and one pass of a pressure roller causes the color to adhere to the paper, after which it may be transferred to the ware. In multicolor decal production a lithographic process is used, with a different lithographic stone employed for each color. The design is applied to the stone with ink, and the stone is etched and varnished so that the design is transferred in varnish to the decal paper. The first color is dusted onto the paper and adheres only to the varnished areas. The same sheet of paper is used on each of the other stones for the additional colors. A photolithography process also can be used to prepare the decal.

Newcomb (1947:199-200), Taylor (1950:34), and Wood (1953:76-77) discuss the application of the decal to the ceramic body. The decal paper is trimmed and moistened with a varnish, or size, made of turpentine and balsam oil. The printed side of the decal is applied against the vessel and rubbed on smoothly with a rubber roller to eliminate blisters in the paper. After a short time the paper is moistened and gently pulled away, leaving the design on the vessel. Decals usually are applied overglaze, but as a final step the vessel must be put through the decorating kiln so that the design will be rendered more permanent by hardening on.

Toward the end of the nineteenth century the use of floral decoration enjoyed a resurgence, and transfer printing declined as the use of decals increased (Wegars and Carley 1982:7). Decals were used for floral accent motifs around the rim or elsewhere on the vessel surface (usually at a smaller scale than transfer-print floral motifs) and for geometric designs around the rim. Decals often occur in combination with gilt and molded designs, and on some vessels with stenciling or tinting (Henry and Garrow 1982b:468). Wegars and Carley (1982:8) point out that "there is likely to be an inverse relationship between the number of colors used and the age of the vessel, that is, vessels with single-colored decals may tend to be older than those with multi-colored ones." By 1885 monochrome outline decals were used as the basis for hand-painted fill-in (U.S. Department of Commerce 1915:156; Wood 1953:77, 487). These, however, should not be confused with early nineteenth-century motifs having a transfer-printed outline with handpainted fill-in, used on Coalport, Swinton, and Bow porcelains (Honey 1952:622).

Henry and Garrow (1982b:468) note that decal-decorated ceramics were not commonly available prior to 1900 except on imported porcelains. Jacobs (1983:22) lists decalcomania as a decorative technique on porcelain and gives it a popularity period of 1880 to 1920. Wechsler (1981:55), however, notes that the decalcomania transfer process had been invented by a Frenchman about 1850. In England, the process was further developed by Minton.

We believe that decal decoration was used on semivitreous British ceramics as well as on porcelain prior to 1900 (see Majewski and O'Brien 1984). It is true, however, that although the use of decals on American-made ceramics was rare before 1900, it enjoyed an extremely rapid rise in popularity (Henry and Garrow 1982b:468; Wegars and Carley 1982:7) and in the 1950s still was "the most common decorative technique used for dinnerware" (Taylor 1950:33). Decals used in the American whiteware industry were supplied almost entirely by European firms (German and French, according to Wegars and Carley 1982:7) until the 1930s, when technical improvements enabled the industry to change to American-made decals (Newcomb 1947:199).

Prior to 1900, decal-decorated ceramics were more costly than transfer-printed wares (S. Henry, personal communication) but soon became lower priced. Examples from northeast Missouri and from one author's personal collection show that decal decoration was used by American manufacturers on low-quality earthenwares by the 1920s.

Handpainting on a Modified Surface

The modified surface, handpainted category includes shell and other embossed, edge-decorated vessels (Lofstrom *et al.* 1982:9; Noël Hume

1970:131) with single color bands applied over the relief design around the rim. Decoration usually is restricted to the vessel rim area, though occasional examples have been reported with additional handpainting in the center (Noël Hume 1969a:393, 396, 1970:131-133). Also included in this category are vessels that have raised lip ridges or panels, ribs, floral motifs, etc., around the rim border area and occasionally around the vessel midline or pedestal as well; and painting on the rim (e.g., a border stripe) or on the body area directly below the rim.

Edge decorated vessels with painted borders were produced in England and exported to America by the 1780s (Noël Hume 1969b:922). Creamware with the raised "feather edge" motif often is confused with the "shell edge" motif (Noël Hume 1970:131), the latter being by far the more popular of the two (compare Figure 3a-c). Press-molded, shell edge decoration appeared about 1775 on creamware (Meteyard 1963:330; Noël Hume 1969a:394) and shortly thereafter was one of the first patterns used to decorate pearlware vessels. The shell edge pattern continued to be popular on white-bodied wares well into the 1800s.

Sussman (1977:106) describes the molded relief, shell edge pattern as an "intricate ruffle that is presumably intended to represent naturalistic shell rims." Another early version of shell edge decoration consists of a series of closely spaced impressed vertical lines. The use of this simple, highly stylized version postdates that of the more elaborate shell edge, since apparently no examples have been found on creamware (Sussman 1977:107-108). Importantly, the presence of this motif on eighteenth-century pearlware contradicts a commonly held belief (Noël Hume 1970:131) in the gradual decadence or stylization of the shell edge pattern throughout the nineteenth century. The most elaborate and naturalistic styles of the pattern eventually disappeared later in the nineteenth century, but it is important to realize that the simpler, stylized versions were being produced concurrently with the more elaborate forms. It also has been demonstrated that the degree of sharpness of the molded relief is not helpful in dating a shell edge piece, since many items obviously were made from worn molds that produced surfaces with very little relief (Majewski and O'Brien 1984:38-39; Miller 1980:4; Noël Hume 1969a:393).

Other variations of the shell edge patterns include the "chicken foot," regularly spaced clusters of two or three curved lines (found only on nineteenth-century pearlware and whiteware), and forms containing irregularly spaced or evenly spaced curved lines (on both eighteenth- and nineteenth-century pearlware) (Sussman 1977:107; Figure 5). Patterns other than shell edge used on nineteenth-century blue and green edge-decorated pearlware and whiteware included floral, leaf, scroll, and geometric motifs (Sussman 1977:107-108), patterns often referred to as "cord with vertical herringbone," "fish scale," "cord and hanging fern/tassel," "scroll and

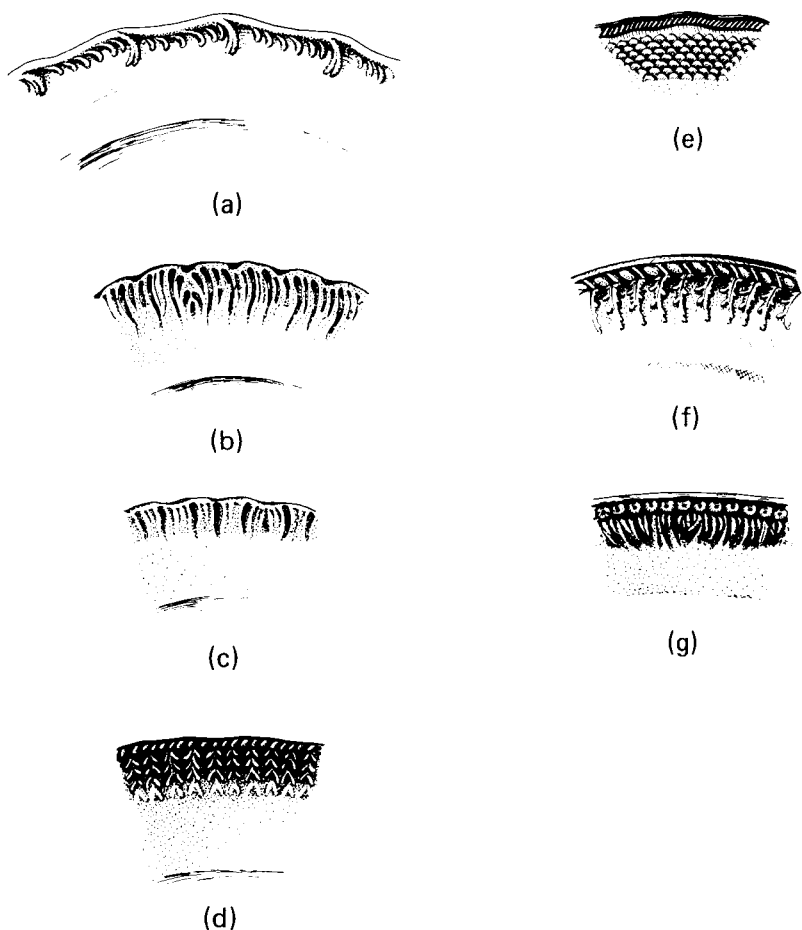


Figure 3. Handpainted, modified edge decoration: (a) feather edge (after Noël Hume 1970:Figure 45); (b) shell edge; (c) shell edge; (d) cord and herringbone edge; (e) fish-scale edge; (f) cord and hanging fern or tassel edge; (g) dot and plume edge.

frond,” and “dot and plume” (e.g., Majewski and O’Brien 1984:38, Figure 21, and Plate 3; Price 1979:17, and plates 1 and 2; Sussman 1977:Figure 7) (see also Figure 3d–g).

Colors used to decorate the edge motifs included blue, green, brown, purple, and pink, though blue was the most popular, with green a somewhat distant second. The other colors apparently were used rarely (Lofstrom *et al.* 1982:7; Noël Hume 1969a:394) and appear infrequently in excavated assemblages (e.g., Price 1979:17). For example, of the tens of thousands of

shell edge plate fragments recovered from late eighteenth- and early nineteenth-century contexts at Williamsburg all are either blue or green shell edge pearlware except for one piece of unpainted shell edge creamware (Noël Hume 1969a:392).

It is more than coincidental that the most popular color used in shell edge decoration was cobalt blue, also the first color to be popular in underglaze transfer printing. The blue used for painting edge decorations changed from a gray-toned blue on pearlware made before about 1820 to a brighter royal blue (Sussman 1977:108). The rarer colors (e.g., brown, purple, and pink) could have been used only as overglaze decoration on edge-decorated wares until about 1820 or 1830, when the technology necessary for producing stable underglaze colors other than blue were developed. Our guess is that by the time it was feasible to use the rarer colors underglaze, blue and green had become the dominant colors for shell edge wares. The rarer colors then became the colors of choice on underglaze transfer-printed whitewares, beginning about 1830.

A misunderstanding exists in the literature as to whether blue or green was the first color used to decorate shell edge pearlware. To take a case in point, Dyson (1982:370), citing Noël Hume (1970:132) and Miller (1980:27–28), states that “In general the green-[shell] edged plates seem earlier than the blue-edged types on American sites.” He divides eight excavated assemblages from Middletown, Connecticut, into two groups based on, among other things, frequencies and percentages of green and blue shell edge tablewares, and suggests that the assemblages having more green-edged wares may reflect households that built up their ceramic inventories at an earlier date.

The question of whether green or blue edge decoration appeared first becomes more than a trivial point when (1) historical archaeologists assign temporal significance to the distinction without first being certain it even exists, and (2) they employ it as a primary building block for pattern recognition or pattern explanation. Wondering how we had overlooked such an important point in Miller (1980) and Noël Hume (1970), we went back to the original sources, only to find that neither comments on which of the two colors was produced first.

A second example of this misunderstanding is found in the work of Lofstrom *et al.* (1982:7, 14), who give a production range of 1780 to 1830 for blue shell edge pearlware and a range of 1800 to 1830 for green shell edge pearlware, based on an examination of ceramic materials in 15 assemblages primarily from military sites or fur-trade-related sites in Minnesota, Nebraska, and Iowa. We question the validity of basing dates of manufacture for a particular type *solely* on its presence or absence in the archaeological record. In addition, shell and embossed-edge wares rarely are

backmarked, making it difficult to pinpoint manufacturers (and thus dates of operation for particular factories) with any certainty.

Since Lofstrom *et al.* (1982:5) claim to be using manufacturing date ranges, the 20-yr head start they attribute to blue shell edge pearlware is misleading, considering that (1) availability and time lag often are critical factors in the interpretation of ceramic assemblages from frontier or otherwise isolated situations, and (2) the dates proposed by Noël Hume (1969a,b) for the appearance of shell edge pearlware in America are based on documentary evidence. Interestingly, Lofstrom *et al.* (1982:7) cite Noël Hume's (1969a:394-395) comment on the virtual absence of green edge-decorated sherds from archaeological contexts prior to 1800, but they fail to mention the documentary evidence summarized below from the same article that actually is more pertinent to the question of manufacturing date ranges.

Noël Hume (1969a:394-395) sheds some light on the temporal problems brought out in the above example in a discussion of the availability of pearlware in America during the late 1700s. He states that advertisements of green- and blue-edged ware appear simultaneously in a New York newspaper as early as 1791. Some merchants advertised only one color, and undoubtedly factors of availability and personal preference dictated what consumers would purchase. But it is important to realize that both colors were being produced in Britain for at least a decade before they became available on the American market (Noël Hume 1969a:394). Noël Hume (1969a:394-395) suggests that the blue always was more popular than the green, which may have been more expensive. Staffordshire price-fixing agreements, however, do not indicate any difference in price between the two (Miller 1980:28).

Shell edge and similar relief edge vessels were produced until approximately 1860, though they appear occasionally in the archaeological record after that time [e.g., in the 1876-1883 levels at the Custer Road Military Dump, Michigan (Brose 1967:59, 69)]. Changes in production technology allowed the price of edgewares to fall, until eventually (*ca.* 1850-1860) they were less expensive than undecorated (ironstone) ware, and the market for them bottomed out (Miller 1973:9, 1980:10).

Miller (1980:4) classifies nineteenth-century shell edge and raised, embossed-edge plates as "the cheapest ceramics available with decoration," along with sponge decorated, banded mocha, and "common cable" (finger-trailed slip). The color along the edge could be applied by a minimally skilled worker, since all that was involved was a series of short brush strokes along the rim. During the 1840s and 1850s the color was applied as a band parallel to the rim, with the raised edged below lending effect to the design (Noël Hume 1969a:393). This technique began as early as 1830 or 1840 and was contemporary with the more carefully applied edge variant.

Shell edge decoration appears on a variety of vessel forms and according to advertisements in New York newspapers was sold in sets by the early 1790s (Noël Hume 1969a:394). Miller (1973:7, citing Godden 1966:xxi) gives a date of about 1812 for the appearance of blue-edged ware as sets and notes that not all pieces of a set were decorated. Cups, for example, rarely were decorated with an edge motif. A complete dinner service consisting of a set of plates and numerous serving pieces was quite costly, and its presence in an archaeological assemblage implies a lifestyle of some means. Sussman (1977:109) indicates that the "status" of a decorative pattern can be determined by its occurrence or nonoccurrence on elaborate serving pieces. Early shell edge pearlware appears in a variety of serving pieces, but its occurrence as serving pieces other than platters is rare by the end of the pearlware period. Nineteenth-century shell edge and embossed-edge nonvitreous white-bodied-ware forms were restricted to plates and platters, a logical fact given the declining status of this decorative class after about 1830. Sussman (1977:109-110) discusses other form-related features of shell edge-decorated wares that can be used as temporal indicators.

To summarize, we find it useful to give the shell edge and similar edge-decorated vessels a general range of appearance from 1780 to 1860. Admittedly, it is important to be able to distinguish early and late examples of the decorative technique, and ware, *if* it can be assessed accurately by the researcher, might offer a means to accomplish this. Blue and green shell edge and embossed-edge pearlwares rarely are seen in post-1830 archaeological assemblages. However, the same decorative techniques were used on whiteware until about 1860. Although Lofstrom *et al.* (1982:10) state they have never seen green on any ware other than pearlware [Sussman 1977:106 states that the use of green painting "diminishes towards the end of the pearlware period" (*ca.* 1830)], we are confident that green was used to decorate whitewares at least until 1840, if not later, as suggested by its appearance on shell edge and other raised, embossed-edge sherds from post-1840 contexts in northeastern Missouri (Majewski and O'Brien 1984).

The shell edge and embossed categories form more internally consistent groups than do the other decorative categories discussed below. However, even though the other categories are quite variable internally, many contain potentially useful horizon markers. Examples in these categories often are elaborate, containing molded lip, rim, and body exterior motifs with hand-painting on or around the motifs. Handpainting appears as highlighting on edge motifs, as lip edge accents, and as slip-glaze shading in pastel and metallic luster colors. In some cases floral and geometric decal designs also were used. Relief designs occur as press-molded motifs or ridges around the rim, or as separately molded low reliefs applied to the surface of the piece with slip (e.g., "sprigging," see Hughes and Hughes 1968a:103-104, 140). Frequently, the raised motifs are accented with gilding, applied either by the

liquid gold method or by the bright burnished gold method or with luster colors.

The liquid gold method, based on the use of sulphurous oils to dissolve gold or to retain it in suspension, produces an extremely brilliant gilt that unfortunately is not wear resistant. Although the method was in use at Dresden by 1830, it was not until 1855 that it came into common use in England to decorate inexpensive bone china and nonvitreous earthenware (Hughes and Hughes 1968a:83). The liquid gold method may have been more cost effective since it contains 10–15% less gold than the bright burnished gold method and does not require polishing (U.S. Department of Commerce 1915:188). A second type of gilding, referred to as bright burnished gold, matt, or brown gold, was invented in 1853 but rarely was used until the late 1860s. A thin paste of gold chloride, bismuth oxide, borax, and gum water was applied by pencil brush. The surface appears dull after firing and is then burnished with agate pencils and cleaned with vinegar to produce a brilliant gold color unique to this method (Hughes and Hughes 1968a:82–83; Mankowitz and Haggart 1957:95; U.S. Department of Commerce 1915:188).

There are other types of gilding (Hughes and Hughes 1968a:82–83), but the two techniques discussed above appear to be the ones used most frequently on relatively inexpensive nonvitreous and semivitreous white-bodied wares dating post-1850. Archaeological examples with only traces of the gold remaining probably were gilded by the liquid gold method.

Nonpainted Relief Decoration

Although we use the term “modified surface, nonpainted” for the sake of brevity in Figure 1, it also is meant to imply nondecaled and non-transfer printed. Few researchers have examined this category in depth. For example, Lofstrom *et al.* (1982:10) group vessels that are “embellished with molded geometric, foliate or floral motifs” with undecorated whitewares. We believe, however, that earthenware and porcelain vessels decorated in this manner are distinct enough to be grouped into a category of their own, and as such their temporal significance is much easier to assess.

Included in this category are vessels lacking decoration except for relief molding. The modified surfaces and associated relief decoration found on these vessels are produced by press molding. This technique was used throughout the nineteenth century on porcelain and other white-bodied wares, and became popular in semivitreous ironstone beginning about 1840. A wide range of vessel forms was decorated in this fashion, from cups, saucers, and plates to serving pieces. This category appears in the archaeological record during the 1840s [e.g., at Fort Renville, Minnesota (Lofstrom *et al.* 1982:10), in the Ozark border region (Price 1979:22), in

Monterey, California (Felton and Schulz 1983:40, 43), in Washington, D.C. (Garrow 1982:156), and at various sites in Ontario, Canada (Sussman 1985)].

These elaborately molded, otherwise undecorated forms were popular in ironstone from 1840 to well past 1900 and are discussed more easily when grouped into three broad temporal spans, each with specific decorative characteristics: (1) 1840–1870; (2) 1870–1890; and (3) 1891 and later (see also previous discussion of ironstone in the section on semivitreous and vitreous white-bodied wares). It is surprising that historical archaeologists have neglected to research this category more carefully, since various decorative styles within it have such potential as temporal markers. Most pre-Civil War examples found in this country are almost certainly of British manufacture and generally are clearly backmarked, with the particular pattern often noted as part of the mark.

Unlike transfer-printed wares, in which a pattern name included in the mark refers to the name of the transfer-printed pattern on the vessel, when a “pattern” is marked on a molded ironstone vessel the name actually refers to the vessel shape. Potters registered the names they gave to the molded surface shapes. Competitors pirated each other’s shapes and modified them slightly by using molded human profiles and floral and geometric motifs in relief to vary the trim under the handles or around the edges of lids or pedestals. Wetherbee (1980:59) notes that familiar names on the shapes of white ironstone helped nineteenth-century consumers to be more explicit when placing orders with the Staffordshire potteries.

Shape becomes even more important as both a formal and a decorative attribute in the study of ceramics produced after midcentury. It is useful to view the varied relief motifs applied on the already shaped surface as secondary characteristics, with the shape designation itself being the primary classificatory attribute. Even today, major ceramic factories produce a wide range of secondary patterns on a limited number of shapes. Thus researchers should familiarize themselves with the characteristics of a shape as it appears on various pieces of a set, in order to facilitate identification of a shape from vessel fragments. Much of the following discussion is taken from an analysis of the shapes discussed by Wetherbee (1980, 1985) in conjunction with data on these styles from nineteenth-century sites in north-eastern Missouri.

All-white ironstone first appeared about 1840 in the *Gothic* family hexagonal and octagonal shapes that already had been used by Staffordshire potters as the medium for cobalt blue and mulberry or cranberry transfer-printed wares (Wetherbee 1980:37). Many of the early patterns were created by Staffordshire potters John Wedgwood, James Edwards, and T. J. and J. Mayer and their successors, though numerous factories produced these

styles throughout the nineteenth century (see Sussman 1985:89–81; and Wetherbee 1980:27–30, 138–140, 1985:21–24, 159–162 for partial lists of British and North American potters who produced ironstone). The most popular shapes of this period were the octagonal *Sydenham* and related shapes, originally produced around 1855 by T. and R. Boote of Burslem. Molded panels, ribs, and scallops often are included on these shapes (see Figure 4a). Always astute in marketing their products, British potters created variations on the *Sydenham* shape that would appeal to the nationalistic spirit of the American consumer, including the Lafayette, St. Louis, and New York shapes. Naturalistic grains, grapes, flowers, and leaves were used as secondary relief motifs from the late 1850s through the 1860s (e.g., Figure 4b). New postbellum shapes included “busier” embossed naturalistic designs and shapes created as part of a minor revival of older Grecian patterns and names. The patterns exhibited narrow ribbing that often covered much of the body, bordered by molded berry, chain, and bud motifs (Figure 4c).

Two major shapes repeatedly appeared in the early 1870s, one characterized by plain, flowing lines on round, oval, and pear-shaped bodies with minimal decoration (Figure 4d), and the other by square and rectangular lines. Completely undecorated ironstones also began to rise in popularity during that period, and together with nonpainted, relief-decorated vessels they had more or less eclipsed handpainted wares by 1860. Other changes during that period noted by Wetherbee (1980:109) include a change in the types of serving pieces used in sets. Large soup tureens and covered sauce tureens were replaced by open gravy boats.

In addition, by 1880 relief decoration tended to be more delicate, often in the form of finely executed floral and abstract motifs on thinner semi-vitreous-to-vitreous white-bodied wares (Figure 4e). This type of decoration on the plainer, round and oval shapes may have been influenced in a general sense by the Art Nouveau movement in England that occurred between 1880 and 1905. The style abandoned “the straight line in favor of the curve” (Garner 1978:17) and featured sinuous and interlacing lines, derived from natural (usually vegetal) forms (Harling 1973:31–32).

After about 1890 Staffordshire factories drastically cut production of the traditional heavy ironstone ware (except for toilet sets and hotel ware), and the items they produced were lighter in weight and often exhibited complex decorative combinations of relief molding, decaling, gilding, and hand-painting (see Figure 4f). Many of the lighter, more vitreous wares were marketed as semiporcelain, no doubt in an effort to compete with the influx of the translucent hardpaste porcelains being manufactured in Germany, Austria, and Bavaria (Gaston 1982).

The above discussion mainly has concentrated on wares of British manu-

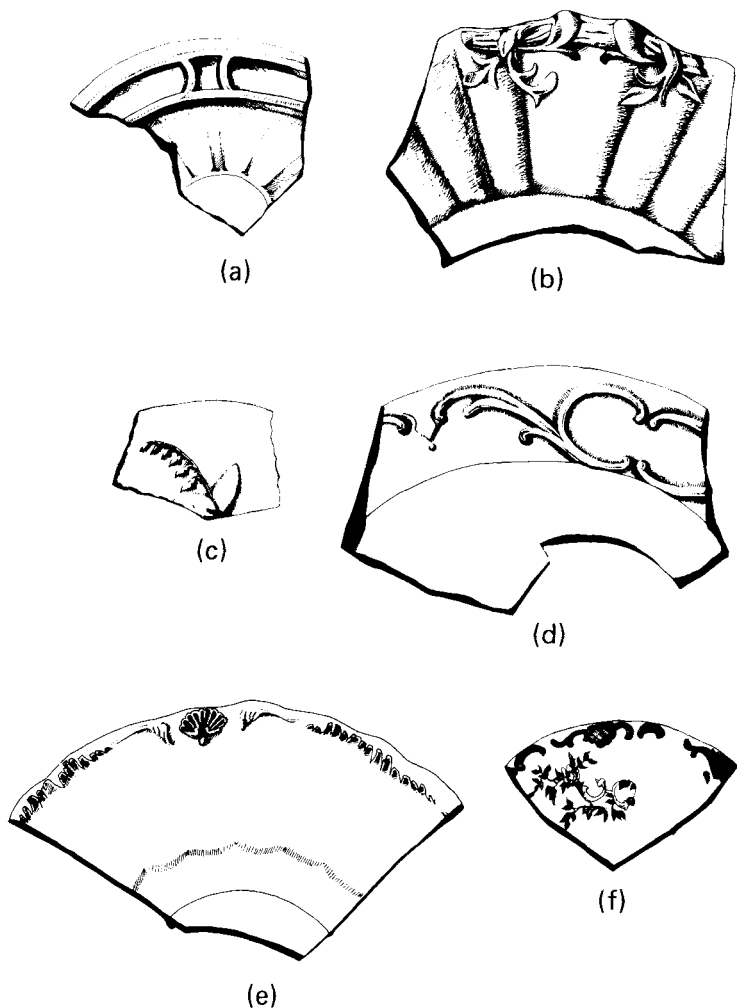


Figure 4. Examples of relief-decorated vessels (all examples from sites in Monroe County, Missouri, at one-half original size): (a) horizontal border panels, fluted interior vessel surface; (b) naturalistic twig and leaf edge-accent motif on fluted vessel interior; (c) bud motif, interior vessel rim accent; (d) interior vessel rim floral motif; (e) shell and wave interior edge motif; (f) interior vessel surface exhibiting complex decorative motif, raised handpainted border with gilded edge (gilding not shown) and multicolored floral decal below.

facture, though after the Civil War semivitreous heavy ironstones were being produced by American and Canadian potters. At first, American manufacturers were experimenting and copied simple patterns and potting methods from the British (Wetherbee 1980:133–135). They struggled with the textures of the native clays, the purity of the white color, and the

smoothness of the glaze. However, by the early 1870s American tableware began to come of age. The most original contributions of American potters came in the manufacture of a series of items that can be classified as non-tableware, such as spittoons, invalid feeders, milk pans, and bread servers. We suspect that these were poured in the molds used for yellowware versions of the same pieces.

Many American-made ironstones were unmarked, thus it may be difficult to separate them from English-made ironstones in postbellum assemblages. However, it is useful to note that many products of American manufacture were plain, with minimal relief decoration.

Handpainting on Unmodified Surfaces

By far the most common decorative motif found on handpainted ceramics is some type of floral design. Unfortunately, most literature on nineteenth-century pottery fails to treat adequately the decorative variability among handpainted wares dating post-1830. Lofstrom *et al.* (1982:6) claim that handpainted decoration is less common on whiteware than on pearlware, and that most floral decoration on whiteware is of a type referred to as "sprig pattern," but this is not axiomatic. There are several varieties of handpainted, floral decoration, based on how the motif was applied: thin line, thick line, or a combination of the two. Floral decoration was applied either freehand using various sizes of china brushes, by stencil, or in the late nineteenth and twentieth centuries by filling in printed outlines.

The thick-line "peasant" style (Bemrose 1952:9; Lofstrom 1976:27; Lofstrom *et al.* 1982:9; Price 1979:20) is characterized by stylized floral motifs done in broad brush strokes that cover most of a vessel surface (Figure 5a). Pearlwares decorated in this style date as early as 1810. Colors used include monochrome cobalt blue and earthen tone polychromes such as brownish green, tan, earthen orange, and yellow (Lofstrom *et al.* 1982:6). These same colors continued to be used on nonvitreous white-bodied wares between 1840 and 1860, along with the bright polychrome palette that included bold blacks, greens, reds, blues, and pinks, in addition to the earthen colors.

Sprig decoration, not to be confused with "sprigging" [a technical term for molded designs applied onto a vessel (Hughes and Hughes 1968a:140)], consists of small floral elements scattered over a plain background. A typical motif (Figure 5b) is composed of a black hairline stem with small green leaves and stylized red and blue flowers and berries (Lofstrom 1976:27; Lofstrom *et al.* 1982:9; Price 1979:20). In contrast to the thick-line style, sprig decoration leaves large portions of a vessel undecorated. For example, a cup may have only two or three repeating motifs around the rim border. All sprig and thick-line painting is done underglaze. Interestingly,

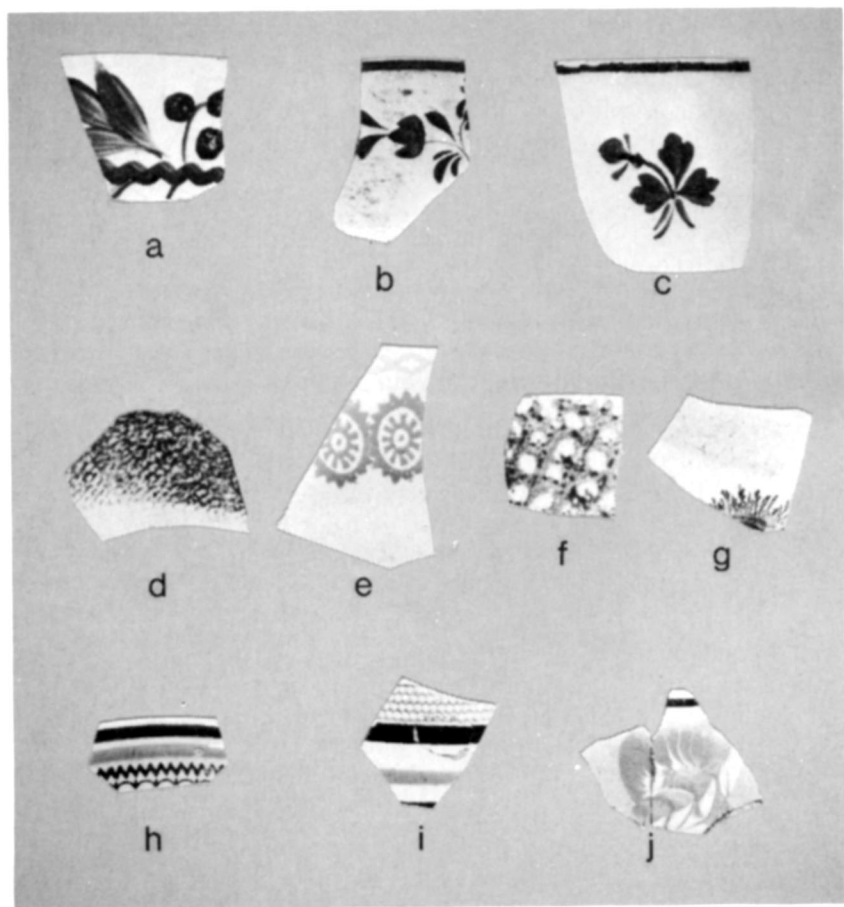


Figure 5. Examples of handpainted decoration (examples from sites in Monroe County, Missouri, or from private collections, at one-half original size): (a) thick-line peasant-style floral motif; (b) sprig floral motif; (c) copper luster tea-leaf motif; (d) spatter decoration; (e) cut sponge-stamped decoration with handpainted border motif; (f) sponge decoration; (g) slip-banded vessel with dendritic mocha motif; (h) dipped or annular-decorated rim; (i) dipped or annular-decorated vessel exhibiting rouletted raised dot design; (j) dipped or annular-decorated vessel with swirled or "finger-painted" motif.

blue, and earthen yellow colors used to create these motifs are identical to the colors used as accent handpainting on transfer prints from 1840 to 1850 (Lofstrom *et al.* 1982:9).

Vessels decorated in the sprig or thick-line floral style usually occur as parts of tea sets, though a few other forms can occur. For example, Price

(1979:21) notes the occurrence of bowls and a possible bottle decorated in thick-line style in her sample from the southeast Ozark border area of Missouri. The lip form of these vessels generally is regular and circular. The peak popularity period for the thick-line and sprig style of handpainting was 1840–1860, though the styles were used as early as the 1830s. Miller (1980:4) places the prices of simple painted wares exhibiting flowers, leaves, stylized Chinese landscapes or geometric patterns above shell edge, sponge-decorated, and mocha, but below transfer-printed wares, since the painters had to be skillful enough to duplicate patterns on pieces for matched sets.

Nonvitreous white-bodied wares decorated with sprig and thick-line motifs rarely are marked. Even so, most examples are of British origin. These decorative styles are ubiquitous at mid-nineteenth-century sites, since identical examples appear at such widely separated locales as Fort Renville, Minnesota (Lofstrom *et al.* 1982), northeastern Missouri (Majewski and O'Brien 1984), the Ozark border region of southeastern Missouri (Price 1979), Monterey, California (Felton and Schultz 1983), Wilmington, Delaware (Klein and Garrow 1984), Washington, D.C. (Garrow 1982), and in Maryland at Tabb's Purchase (Miller 1974). American earthenwares available at that time, such as yellowware, Rockingham, and a small amount of whiteware (Ketchum 1983:11–12), were not being produced on the same scale as the British wares, nor were they being marketed as efficiently.

Thin-line floral elements, such as flower stem or floral outline shapes, appear to have been painted by using the tip of a very fine brush. Thick-line floral designs probably were produced by using broader brush strokes or stencils, so that leaves and petals could be applied uniformly to give a solid, filled-in look to each element. Frequently, the two types of decoration were combined on a vessel also having handpainted border stripes. A wide variety of colors were used, including the same dark blue used on transfer prints circa 1840–1860.

Rather crudely applied handpainted decoration, such as that discussed above, in general was popular from 1840 to 1860 (and probably even later). Colors varied and were used both monochromatically and in polychrome combinations. By 1850 nonvitreous white-bodied wares and inexpensive porcelains (probably bone china) were the most common medium for handpainted floral expression. Handpainting on porcelain often occurs in a layered fashion, where successively applied and hardened-on overglaze colors create a textured effect. Decoration in this style is easy to identify, since some colors appear sharp and well defined, while others are partially worn away or discolored. This type of decoration occurs on various vessel forms and often appears on dinner sets.

From 1880 to 1905, overglaze china painting became the "thing to do" for the unattached young lady. China companies produced large quantities of plain white-bodied ceramics, while entrepreneurs arranged for firing of decorations (Wood 1953:3, 7). Wegars and Carley (1982:10) remark that although most of the decoration was done overglaze, some was underglaze. Floral designs probably were the most popular motifs, but border designs and portraits also were common. Much of the painting was done freehand, but by 1900 "color studies" (decals) and stencils could be purchased and airbrushes were introduced for use with stencils to produce naturalistic toning. Decal outlines often were used as the base for handpainted touch-up (Wood 1953:7, 63). On examples we have seen, execution of the hand-painted motifs ranges from quite crude to extremely well done.

According to Ray (1974:221) and Wetherbee (1980:122), undecorated semivitreous ironstones were introduced around 1850, but from approximately 1880 to 1900 the simply executed tea-leaf luster motif (Figure 5c) (called the "Lustre Band and Spring" or "Lustre Spray" by manufacturers) was an extremely popular variety. Introduced in the 1850s, it did not reach peak popularity until much later. The outline of a design was printed on a vessel surface before the piece was glazed and fired, after which the copper or gold luster was applied by hand, covering the design entirely. Thin luster bands often then were applied to molded body shapes that already had been marketed as white ironstone with no added color. By the late 1870s, English potters had perfected a more permanent underglaze copper luster (Wetherbee 1980:123-124). Dinnerware and sanitary-ware sets in a multitude of different forms were produced for the American market by at least 18 Staffordshire potters, including Thomas Furnival; Alfred Meakin; and Mellor, Taylor and Company. In the United States, Mayer Pottery Company, Beaver Falls, Pennsylvania; Wick China Company, Kittanning, Pennsylvania; and Cartwright Bros., East Liverpool, Ohio, were leading producers (Ray 1974:221-222).

Another class of handpainting contains border-lined or banded vessels, mainly cups and saucers, decorated only with a painted band around the rim or with a series of concentric bands encircling the body. Colors included green, red, black, and light and dark blue. Price (1979:20-21) notes that this variety presents a problem, in that many of the vessels grouped in this category probably are rim sherds of vessels that if found in a more complete state would be classified as handpainted floral. Banded vessels became popular in the early twentieth century, as indicated by their presence in mail-order catalogs of the period.

There are, however, examples in which border lining or banding was used as a decorative technique by itself. We use the term "line" to encompass both stripes and bands. Stripes measure less than a centimeter in width and can be either thick or thin. Bands have widths greater than or equal to a

centimeter. Thick-line and thin-line stripes often were used beginning late in the nineteenth century in conjunction with multicolored decals as border decoration. Single or multiple thick-line and/or thin-line gold stripes around the borders of white-bodied vessels that lack other decoration were used to decorate sets containing a wide range of vessel forms. We date the style post-1860, based on the types of gilding (very bright gold). No mention of this particular style was found in the literature, though Jacobs (1983:22) lists gilded and edge-lined porcelain from the Butler's Barracks military midden as having popularity ranges of 1815-1866 and 1815-1900, respectively.

A third class of handpainting is sponge and spatter decoration, terms that often are used interchangeably by collectors and archaeologists, though the literature suggests there may be several temporally distinct variants (cf. Figure 5d and e). These decorative techniques were executed on inexpensive nonvitreous earthenwares in a multitude of underglaze colors (shades of red, yellow, green, purple, blue, pink, brown, and black) (Robacker and Robacker 1978:36-37). Although much spatterware is unmarked as to the manufacturer, it was produced in great quantities by British potteries throughout the nineteenth century, primarily for export, and in the United States after about 1850 (Ketchum 1983:177-78); Robacker and Robacker 1978:32-33).

Spatter decoration was applied variously to the border, the center, or the entire surface of a vessel. Ray (1974:211-212) notes that on the earliest pieces, spatter decoration was produced by tapping a brushful of paint against the vessel being decorated, often creating designs through stencils. In 1845 a cut-sponge process was developed, whereby color-filled sponges resembling stars, flowers, angels, eagles, and other forms were used to produce concise decorative motifs (for examples in an archaeological assemblage see Price 1979, Plate 7). Spatter decoration appears on a wide range of tableware forms (sometimes in sets), and on tea services and toilet ware. The shapes used as a base for this decorative technique were those commonly used for other inexpensive wares of the period (Robacker and Robacker 1978:41).

Ray (1974:211-212) describes a variant of spatterware that she classifies as part of the Pennsylvania Dutch style, dating from about 1835 to 1885. Robacker and Robacker (1978:27-50) refer to this variant as "true spatterware" and note that although the use of spatter decoration was common from the 1820s until after 1860, it was most popular between 1830 and 1840. Cole (1967:89) suggests earlier dates (*ca.* 1820-1860) for this style and characterizes it as earthenware bordered with stippling in red, blue, and green, colors similar to those used on handpainted sprig-pattern white-bodied wares. Most vessels in this style also exhibit freehand center designs, the most popular being the peafowl, the schoolhouse, and the tulip and rose

patterns, though 80 or more patterns may have been in use (Greaser and Greaser 1973; Robacker and Robacker 1978:43-47). Sets of tableware in these patterns appear to exhibit a wide range of intraset variation.

Robacker and Robacker (1978:51-64) categorize "design spatter" as a "structured" variety of spatter with small, shaped areas of dots, in contrast to the large, continuous, closely spattered areas characteristic of true spatterware. While the dots themselves do not quite touch, they often are placed close together, and individual designs or motifs often do touch or overlap. The design spatter effect probably was produced by using templates, stencils, or cut sponges. Few examples are marked as to the manufacturer, but similarity in style and colors used suggests that design spatter was contemporary with true spatter, though some examples may date to the late nineteenth century.

Robacker and Robacker (1978:74) also discuss stamped, cut sponge-decorated ware, a nonspotted, nondotted, stamped ware decorated with smooth cut sponge roots. It often is referred to as "stick spatter," but they feel the latter term is a misnomer that should be applied to design spatter if it is to be used at all. In sponge painting the root of a sponge, which is firmer and more closely textured than the familiar top portion, was cut in the pattern desired, then dipped in color and applied by hand to the ceramic body (Findlayson 1972:54). A variety of this decorative category now known as "Portneuf" was decorated in vividly colored sponged motifs with brush-painted or sponged bands around the border. It was exported from Great Britain and particularly Scotland to Canada from about 1840 to 1920 (Collard 1967:144-147; Findlayson 1972:51-56; Robacker and Robacker 1978:84-87).

While spatter decoration tends to be applied in more distinctive, concise patterns, some designs that are sponged appear as if they were applied by a sponge or chamois with large interstitial openings, and often sponge decoration is used to cover the entire vessel and appears rather "smudged" (Figure 5e) (Ketchum 1983:229). In spattering, colors usually are applied as separate and distinct parts of a pattern, while in open-sponge decoration colors often are applied over one another. Robacker and Robacker (1978:65-73, 118-121) use the terms "flowing spatter" and "kitchen" or "cottage spatter" to refer to several varieties of this type of sponge-decorated ware.

Sponge decoration of this type is found on a variety of tableware forms, as well as on mixing bowls, heavy pots, and other kitchenware. It occurs on stoneware and on nonvitreous-to-semivitreous wares and was made by British and American (especially those in New Jersey and Ohio) potteries from 1860 to 1935 (Ketchum 1983:178, 228-229).

Ray (1974:211) states that although spatterware was offered for sale all along the Eastern seaboard, it found ready sale only at the port of Philadelphia. She notes that the "thrifty, color-loving Germanic settlers in

the Philadelphia hinterland . . . took it to heart and made it their own.” We cannot agree with this notion of regionalism for any of the spatter or sponge variants since spatter-, sponge-, and cut sponge-decorated ceramics appear in varying amounts in nineteenth-century archaeological assemblages from all over the United States (and probably Canada as well), for example, in northeastern Missouri (Majewski and O’Brien 1984) and in the eastern Ozark border region (Price 1979), at Fort Renville, Minnesota (Lofstrom *et al.* 1982), at several sites in Nebraska (Steinacher and Carlson 1978), in Wilmington, Delaware (Klein and Garrow 1984), in Washington, D.C. (Garrow 1982), and in California (Felton and Schulz 1983).

A fourth class of handpainting, variously termed dipped, annular, banding, or slip banding, refers to a technique used to apply horizontal bands or stripes of colored slip, usually to hollow vessel forms such as mugs, bowls, cups, and covered dishes. The bands or stripes have slight relief, as opposed to being flat, painted-on decorations. When executed poorly, the bands or stripes may pull away from the body. Through time, the bands tended to become wider, and colors changed from earthen browns, yellows, greens, blues, and black to brighter colors such as bold blues, yellows, and white upon which very narrow white or black bands were placed. Vessels may be further embellished with one or a combination of the following: engine-turned or rouletted decoration, handpainted swirls, cat’s-eye dots, marbled or scrambled motifs, and “mocha” designs (see Figure 5f-i).

Engine-turned or rouletted decoration is produced when a diamond-, raised dot-, chevron-, or other-shaped instrument is pressed through a slip into a still damp vessel as it is turned on a potter’s wheel, thereby exposing the contrasting body beneath (Godden 1963:105). Handpainted motifs used on annular wares as accents between bands or in large open areas of a vessel include swirled designs resembling finger painting or black-and-white “cat’s eyes.” In addition, zigzag and other abstract-shaped concentric lines often are applied between bands. Sometimes the term “mocha ware” is used synonymously with annular ware, but it actually is a variant of the latter. Mocha, or “dipt” (cf. Van Rensselaer 1966:337), decoration is created when an acidic mixture (consisting of various combinations of tobacco juice, hops, urine, dry printer’s black, turpentine, citric acid, and water) is dripped onto an area of colored slip, where it spreads into dendritic forms resembling trees, seaweed, fronds, etc. (Ray 1974:180; Van Rensselaer 1966:337).

Most annular-decorated nonvitreous earthenware was produced in England from about 1790 (South 1977a:212) through the early twentieth century as an inexpensive ware for both local use and export (Van Rensselaer 1966:338). Annular decoration may have been used on early creamwares, but the term “banded creamware” (Van Rensselaer 1966:337) probably should be used in a more generic sense to refer to buff-colored paste or cream-colored paste, nonvitreous earthenwares such as cream-

colored (CC) ware. Some annular wares were produced in the United States by about 1850 (e.g., by Edwin Bennett, Baltimore) (Ray 1974:138). Miller (1980:3-4) places "banded and mocha" in his next-to-lowest price category, classifying its decoration as "minimal . . . produced by minimally skilled operatives." There usually is a wide range in decoration on vessels of similar size and form.

Colored slip glazes or engobes often were applied to the interior and exterior of vessels for decorative effect. Brightly colored "Fiesta ware," introduced in the 1930s by the American firm Homer Laughlin Company and copied by other potters, is a well-known example of this decorative category. Shading and stenciling in luster colors were popular decorative techniques used well into the twentieth century (Cameron 1986:207; Wegars and Carley 1982:9-10) that also were used frequently throughout the nineteenth century. Most nineteenth-century ceramic assemblages contain a small percentage of luster-decorated sherds, often representing tea-set forms. Hughes and Hughes (1968a:103-106) provide a useful summary of the many varieties of nineteenth-century luster along with dates of introduction for each.

Ray (1974:127) notes that only two metals were used to produce the many variations. All silver lusters were made from platinum oxide, while copper, bronze, gold, yellow, pink, mottled pink, ruby, and deep purple all were made from gold. Gold applied over a dark background (e.g., a reddish-brown clay) produced copper as well as gold luster; gold on white or light-colored backgrounds was used to obtain pink luster and its variants. Resist decoration, the stencil process in reverse, was often used in combination with metallic luster.

Undecorated

As mentioned earlier, undecorated, or "plain," vessels form a distinct decorative class, where the lack of decoration is in effect a decorative statement. We recommend that analyses of undecorated ceramics concentrate on ware, since ware-based categories such as nonvitreous cream-colored ware and semivitreous ironstone often exhibit completely undecorated variants. Porcelain rarely occurs undecorated, so when porcelain sherds lacking decoration appear in archaeological assemblages, it probably is safe to assume that they simply represent undecorated portions of decorated vessels.

CHRONOLOGICAL PLACEMENT OF CERAMIC TYPES OR SITE ASSEMBLAGES

Our discussion of decorative styles and elements demonstrates that methods and techniques of decorating porcelain and refined earthenwares

changed through time, though the rate of change varied considerably. Thus some decorative styles and elements are useful for assigning ceramic materials to fairly short time spans, while others are not as useful. By combining the dates associated with the shorter-lived horizon markers and the relative proportions of various ceramic categories within a ceramic assemblage, the archaeologist can begin to bracket temporally a particular site or site component.

Information on the manufacture date of a specific category of pottery can be found in account books, bills of lading, newspaper advertisements, company histories, and patent records (Cushion 1980; Miller 1980; Noël Hume 1969a; South 1977a). The date of manufacture obviously does not coincide with the date an object becomes part of the archaeological record, but it provides a *terminus post quem* date, or the date after which an artifact found its way into the ground (Noël Hume 1970:11). Backmarks also are important for dating ceramics. Styles of marks are associated with specific ceramic producers, and certain marks often can be dated to shorter time spans within a company's existence. Because of their importance, we discuss below in some detail backmarks and how to use them.

Backmarks

Backmarks impressed, transfer printed, or painted on the bottoms of ceramic vessels provide important information on date of manufacture, company affiliation, importing practices, and other types of marketing information. Backmarks can be workmen's marks, seals, or motifs, signifying a particular company, a pattern name, or an importer. Cushion (1980:5) notes that marks may be applied to pottery in any of the following ways, singly or in combination: (1) by incising or scratching the soft, unfired clay; (2) by impressing one or more stamps into the unfired paste; or (3) by painting, transfer printing, or stenciling over or under the glaze.

Workmen's marks, in the form of numbers, letters, or some other identifying signs, often were scratched or impressed into the biscuit before firing, solely for the information of the management of the pottery. "Throwers" and "assemblers" used a scratched mark, while painters (including transfer printers) and gilders left their mark in the color or in the gold. Impressed marks might also refer to the composition of the paste, to the mold number, to specific vessel size, or they might provide information to the kilnmaster as to the vessel placement in the firing oven (Collard 1967:324; Cushion 1980:4). Little (1969:36) notes that impressed and printed letters and numbers can also be tally marks used by workmen.

When workmen's marks are found alone on a vessel, they rarely can be attributed to a particular factory. However, impressed marks of various sorts frequently are found together with identifiable transfer-printed

manufacturer's marks. Yet even when workmen's marks can be attributed to a particular factory, it is difficult to pin down the exact meaning of a symbol, a number, or a letter. Nonetheless it is important to recognize them for what they are and not to confuse them with other types of marks that ultimately are more informative. American-made vessels are less likely to exhibit workmen's marks; instead, stamped or printed manufacturer's marks often include a batch designation indicating the year the pottery was produced as well as other information regarding the particular ware.

The majority of nineteenth-century English marks are sharply defined underglaze black transfer prints. Colored marks or pattern names appear on transfer-printed vessels and usually are done in the same color as the print. Many marks combine a stock design with the name of the manufacturer. The three most commonly used motifs are illustrated in Figure 6: the royal arms, the royal garter (strap and buckle), and the Staffordshire knot. Other designs include the Prince of Wales feather crest, crowns, and the eagle, the latter especially common among potters who competed for a share of the American market (Godden 1972:257; Little 1969:36–37). In addition to the company insignia, a typical mark also might contain a printed pattern number, the name of the particular body used (e.g., ironstone, ivory body), any number of workmen's marks (Collard 1967:324), or even a diamond-shaped, Patent Office registration symbol incorporated into the design.

Very little American-made pottery was marked before 1850, but after midcentury factory marks became more common. One reason for this was an attempt by American potters to convince consumers to abandon their long-standing preference for imported English wares. Familiar British symbols were pirated and used through the late 1880s, and even diamond-shaped marks occasionally were used in American marks (Gates and Ormerod 1982:9–10). In general, transfer-printed marks on nineteenth-century American pottery tend to be of poorer quality than their English counterparts and often are blurred and difficult to read. Marks dating from 1875 to 1910 tend to be either quite elaborate, employing varied shapes and

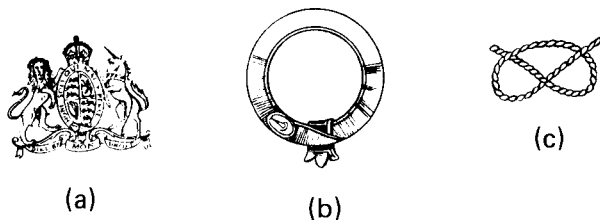


Figure 6. Stock designs used as makers' marks on nineteenth-century British refined earthenware: (a) royal arms; (b) royal garter; (c) Staffordshire knot. (From Godden 1972.)

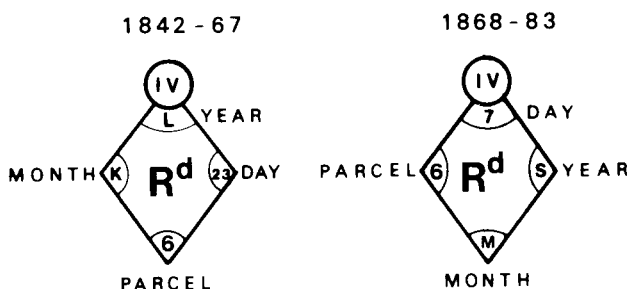
designs, or very simple, displaying the company name, shape, or pattern information in script or block letters.

Company records often allow one to assign definite time spans to marks. Gates and Ormerod's (1982) study of marks on nineteenth- and early twentieth-century pottery from the East Liverpool, Ohio, district is a pioneering effort to catalog the marks from a major American ceramic district. Other works chronicling the American pottery industry have tended to lack the detailed information on company histories needed to identify often rapidly changing backmarks. Considerably more information exists for English marks. Godden (1964, 1972) and others (e.g., Cushion 1980; Thorne 1947) have provided a wealth of data that often can be used to date English backmarks to very short time spans. Even if one encounters a partial mark or one that is not listed in sources such as those mentioned above, there are various details of English marks that offer clues as to their temporal placement.

Variations of the royal arms were used from the early nineteenth century on. Pre-1839 arms have an inescutcheon, or extra shield, in the center, while arms used after 1837 have a simple quartered shield. The royal garter was incorporated in marks from the 1840s on, and the Staffordshire knot was used beginning in 1845, though it was most popular during the 1870s and 1880s (Godden 1964:552). The use of "Ltd." with a company name indicates that a vessel dates after 1855. Individual companies began using "Ltd." at different times, however, and its use on vessels made in the Staffordshire district suggests a date after 1860. The words "Trade Mark" or "Trademark" incorporated in the label signify a post-1862 date, and "Royal" indicates a date after midcentury (Godden 1972:257). It previously was thought that potters added "England" to marks from 1891 on, in compliance with the American McKinley Tariff Act that mandated the identification of origin of all goods exported to America (Godden 1964:552). However, Godden (1972:257) and Collard (1967:323-324) suggest that a post-1880 date is more accurate, since several marks with the word "England" appear in Jewitt's 1883 edition of the *Ceramic Art of Great Britain*. When "Made in England," "English Bone China," or "Bone China" appears on a vessel, a twentieth-century date is indicated. A date incorporated as part of an English factory mark more likely refers to the founding date of the factory than to the actual manufacture date of the vessel (Collard 1967:324).

Vessels that have an impressed or transfer-printed diamond mark can be dated to within a few years of their manufacture. The diamond mark was used from 1842 to 1883 to indicate that a particular design was registered with the British Patent Office by the manufacturer (British or otherwise), retailer, or wholesaler. The various letters and Roman and Arabic numerals contained within the diamond mark can be deciphered to give the exact

registration date for a ceramic design (see Figure 7). Once all or part of the mark is decoded, one has only to locate the date in the *Class IV Design Index* from the British Public Record Office to find the patent number and the name of the firm that registered the design (see Cushion 1980:173, 210 for that part of the *Class IV Design Index* relating to pottery and porcelain). The latter information is especially useful, since diamond marks often appear without the manufacturer's name. The index does not list the actual item being registered, though printed diamond marks on vessels usually



YEAR LETTERS

1842-67

1842	X	1855	E
1843	H	1856	L
1844	C	1857	K
1845	A	1858	B
1846	I	1859	M
1847	F	1860	Z
1848	U	1861	R
1849	S	1862	O
1850	V	1863	G
1851	P	1864	N
1852	D	1865	W
1853	Y	1866	Q
1854	J	1867	T

1868-83

1868	X	1881	E
1869	H	1882	L
1870	C	1883	K
1871	A		
1872	I		
1873	F		
1874	U		
1875	S		
1876	V		
1877	P		
1878	D		
1879	Y		
1880	J		

MONTH LETTERS

1842-83

January	C	July	I
February	G	August	R
March	W	September	D
April	H	October	B
May	E	November	K
June	M	December	A

Figure 7. Key to features on the diamond-shaped Patent Office registration marks used on British goods manufactured between 1842 and 1883. The mark on the left was used between 1842 and 1867, the mark on the right between 1868 and 1883. The two examples illustrate the different positionings of letters and numerals used to indicate year, month, day, and parcel number. The Roman numeral IV indicates that the class of material being registered was ceramics. Year and month codes are presented below the examples. The major exception to the codes is the period March 1-6, 1878, when the letter W, instead of D, was used to indicate the year, and the letter G, instead of W, was used to indicate the month. (After Cushion 1980.)

refer to the applied pattern (raised design, transfer-printed pattern name, etc.), while impressed or molded versions more likely refer to the form of the vessel (Collard 1967:325-27; Cushion 1980:172). Collard (1967:326) notes that only those designs likely to be pirated were registered. It is important to use diamond-mark dates as *terminus post quem* dates only, since although the initial registration protected a design for 3 yr, it could be renewed for another period.

Beginning in 1884, the British Patent Office replaced diamond marks with consecutive registration numbers, which were imprinted on vessels and preceded by "Rd." or "Rd. No." By 1900 more than 350,000 designs had been registered (Collard 1967:326; Cushion 1980:5). Cushion (1980:172) lists the range of numbers used for each year between 1884 and 1909.

During the nineteenth century some colonial ceramics merchants ordered wares from English potteries with their own names printed on the back, and these should not be confused with manufacturers' marks. Dealers' and importers' marks generally can be dated with precision by checking gazeteers or city directories to determine when a particular business was in operation (DeBarthe 1979:75). Collard (1967:99) notes that such marks serve three important historical purposes: (1) they illustrate the dealings of retail and wholesale ceramics merchants (thus providing insights into nineteenth-century economic history); (2) they are an unusually reliable guide to wares actually offered for sale, and in use, in a particular area; and (3) they provide accurate evidence for the periods when such wares were new furnishings for homes. Early retail or wholesale dealers' and importers' marks usually did not include the maker's identification. However, the actual maker occasionally can be ascertained if the vessel also happens to carry the manufacturer's diamond-shaped registration mark. Most earthenwares and porcelains with dealers' marks date to the last quarter of the nineteenth century, though earlier examples do occur (Collard 1967:92).

Different styles and colors of marks can provide clues to the nature of the ware or the decorative attributes of a vessel. For example, around 1800 Josiah Spode II initiated the practice of printing on the bottom of a piece the name of the transfer-printed engraving used. Soon after, pattern names were placed within ornamental scrolls, and by the period 1830-1840 foliated and flowery cartouche and wreath marks were used almost universally (Little 1969:35, 96). Many such marks contain no reference to the actual manufacturer, but as Little (1969:31) notes, occasionally the factory can be identified by the shape of the cartouche or scroll in which the pattern is printed. Many undecorated ironstones have transfer-printed black manufacturers' marks that use the royal arms stock design along with the company name. Other decorative types, such as spatter ware, banded ware, vessels with handpainted floral or shell edge decoration, and much of the early softpaste porcelain, rarely are backmarked.

In summary, although backmarks on nineteenth-century ceramics are one of the most important temporal clues available to historical archaeologists, they often are misleading and must always be considered in the proper historical context. Collard (1967:325) reminds us that "the appearance of the mark itself and the type of ware on which it is found has always to be reconciled to any statement concerning date." Also, many ceramics never were marked. In the following excerpt, Little (1969:35) is referring to later Staffordshire blue transfer-printed wares (*ca.* 1830–1850), though what he says is equally applicable to nineteenth-century refined earthenwares:

Some of the later potters, and perhaps some of the earlier, lesser-known ones, seem to have made a point of not marking their wares, possibly in order to be able to compete more easily with better-known makers. . . . Cases even occur where firms deliberately used misleading marks, hoping they would be mistaken for those of an old-established, more reputable potter. Others, however meticulous they may have been in applying marks, were accustomed to marking only a certain number of pieces in each service, obviously never dreaming that individual pieces might one day be sought by collectors [or found by archaeologists].

Other Dating Methods

A widely used, but often misapplied (see following discussion), method of dating ceramic assemblages is the *mean ceramic date formula* developed by South (1972a, 1974, 1977a), which uses the median manufacture date (the point between the beginning and ending manufacture dates) of certain ceramic types to arrive at a mean date for an assemblage. The formula (South 1972a:73) considers both frequency of occurrence and presence or absence data for an assemblage and is based on two assumptions: (1) that the ceramic types under analysis are roughly contemporary on all sites at which they are found and (2) by implication, that the midrange date of manufacture approximates the model date of popularity (the problem of "core versus periphery" delay, that is, time lag between the center(s) of introduction and outlying areas often is acknowledged but seldom dealt with). The date, Y , is derived from the formula

$$Y = \frac{\sum_{i=1}^n X_i f_i}{\sum_{i=1}^n f_i}$$

where X_i is the mean date for the manufacture of each ceramic type; f_i is the frequency (number of sherds) of each ceramic type; and n is the number of ceramic types in the sample.

The method has been used widely on aggregate assemblages from eighteenth- and nineteenth-century archaeological sites, though there often

are reasons to apply it on a feature-by-feature basis (South 1977a:216; Turnbaugh and Turnbaugh 1977).

The method has been modified by various investigators, especially by those using it to date nineteenth-century assemblages, where application of the formula often has produced uneven results (Lofstrom *et al.* 1982; Smith 1976; Waselkov 1979; Waselkov *et al.* 1975). For example, Lofstrom *et al.* (1982:3) modified the formula for use with late eighteenth-century ceramics by considering actual vessel counts per type and by adding a constant: 1700 for the eighteenth century and 1800 for the nineteenth century. Salwen and Bridges (1977) calculated the mean for both the initial and terminal manufacture dates of all ceramic types in an assemblage, using the date range suggested by South (1972a, 1977a) and Noël Hume (1970). The mean ceramic date method apparently does not work well on late nineteenth-century and twentieth-century sites (S. Henry, personal communication). As we discuss below, the disparity between dates derived by the method and those derived from documentary sources should be examined closely to discover the sources of discrepancy.

Rapid industrialization and technological advances in the field of ceramic production throughout most of the nineteenth century are cited as reasons underlying a need for a dating system that provides more precise temporal brackets than those given by ware-type manufacturing ranges. The mean popular dating concept, which isolates particular decorative techniques and their periods of popularity, has been proposed as an alternative to the mean ceramic date formula (Burke 1982; Jacobs 1983; Lofstrom *et al.* 1982). Popularity periods are defined on the basis of historical documentation and information from dated archaeological contexts. Peak popularity dates are substituted for the median manufacturing dates in South's mean ceramic date formula. Such a substitution is in line with some earlier criticisms of South's method that pointed out that the normal curve implicit in the model does not necessarily reflect the true nature of the life of a pottery type. Rather, types can show their greatest popularity soon after inception, followed by a long period of decline (Cleland 1972:186). The mean popular dating concept has been tested successfully in several instances, most notably by Jacobs (1983), who applied the method to a ceramic sample recovered from a nineteenth-century military midden from the Butler's Barracks complex at Niagara-On-The-Lake, Ontario, Canada, to arrive at a date that agreed with the date of occupation derived from documentary evidence.

Several caveats have been attached to the use of dating techniques that involve the mean dates or popular dates of ceramic materials in light of published discrepancies between the date derived from the material remains and that derived from the historical record. Some archaeologists and historians (e.g., Liggett 1972; Walker 1972) are opposed to the use of these

techniques because they believe there is no basis for the formulas. South (1972b:209) notes that much of this reaction is "an example of the intuitive rejection of the concept rather than a weighing of empirical archaeological data relating to the pragmatic application of the formula."

Any number of reasons could contribute to a discrepancy between dates, such as conservation of ceramic items, differential breakage, repair and further use of broken materials (see Miller and Hurry 1983), and secondary acquisition of goods discarded or given away by former owners. South never intended for his formula to be applied strictly as a blind dating tool, though it often has been used as such. In instances where the mean ceramic date does *not* agree with documentary evidence, archaeologists should use the mean ceramic date concept "as a tool to search for other, less obvious explanations of human behavior" (Turnbaugh and Turnbaugh 1977:90). Well-reasoned explanations for discrepancies include those by Deetz (1977) for the Parting Ways site, Turnbaugh *et al.* (1979) for the British frigate HMS *Orpheus*, Salwen and Bridges (1977) for British colonial features in the Carolinas, and Wheaton *et al.* (1983) for southern plantation slave quarters.

The study by Wheaton *et al.* (1983) is particularly important because the authors attack directly the problem of acquisition and discard rates:

The concept of mean ceramic dating is based on the premise that datable ceramics will be acquired, broken, and discarded at a fairly uniform rate throughout the occupation history of a site. If a degree of uniformity of acquisition and discard occur, then application of the . . . concept should produce a date that is roughly equivalent to the mean occupation date of the site. The major variables that can materially alter the results of the MCD if acquisition and deposition are uniform and the ceramics are correctly identified would then be [the] use of erroneous dates for the individual ceramic types or excavation sample error. . . . If those variables have been successfully controlled, then the most likely answer for the late MCD . . . relates to the process of ceramic acquisition and discard that took place at the site. (Wheaton *et al.* 1983:280)

The problem of breakage, deposition rates, and time lag in archaeological assemblages also is discussed by Adams and Gaw (1977), Hill (1982), and Worthy (1982). We treat these topics in more detail in a later section.

BEYOND CATEGORIZATION AND DATING

Many studies involving ceramics have advanced beyond grouping and classification to discussions of chronological inference, but significantly fewer have successfully used archaeological data to structure behavioral generalizations that are testable against fresh data sets. There may be two reasons why so few historical archaeologists haven't taken "that next step from data to theory" (South 1977a:235). First, the basic building blocks both of grouping or classification and of chronology must be in place

before the next analytical step is taken. Second, the classes (or types) used in chronology building must be suitable units for bridging the gap between inference and verification. With regard to pottery, often the ceramic units used in analyses of nineteenth-century culture are not appropriate for the tasks.

Fagan (1972:213) states that "Unless ceramic studies lead to a better understanding of the cultural context in which they are founded, [pots] form a sterile record of very limited historical value." Historical archaeologists often have a wealth of archival and documentary information at their disposal, including information on the production and marketing of ceramics, which places them "in the unique position of being able . . . to control certain variables while delineating archaeological patterning, an advantage not possible in the absence of documentation" (South 1977a:235). Archival information is not a substitute for archaeological data but rather is an equal partner.

In this section we move beyond grouping, classification, and time to examine the expanding role played by ceramic materials in attempts to understand both the archaeological record and the cultural milieu of which ceramics were a component. We divide the section into two parts: pattern recognition and behavioral generalizations. The two are inextricably interrelated, but in the normal course of analysis the former precedes the latter. We emphasize that there is nothing magical about patterns in archaeological data. Human behavior is patterned, thus the by-products of behavior should to a large degree be patterned. Meaningful pattern recognition is a result of controlled sampling procedures, a knowledge of the cultural system of which the artifacts are a reflection, and common sense. Even a potentially superior data set can be tarnished by a lack of theoretical grounding and/or analytic rigor.

Unfortunately, some archaeologists appear to view pattern recognition as an end in itself, though they may pay lip service to the fact that behavior created the patterns. Others appear caught in the teleological trap of trying to explain the patterning through reference to the component parts of the pattern. Some pattern recognition studies are purely inductive exercises that have little or no substantial grounding in a theory or its deductively derived propositions. Resulting patterns are normative constructs, though often based on multiple artifact assemblages, of the way things ought to be. Other studies have taken into account the social, economic, technological, and ideological aspects of the cultural systems (global, regional, and local) of which archaeological deposits are a reflection (see South 1977b) and then used carefully reasoned arguments to structure testable propositions about the content of an assemblage. In the first part of this section, we examine several examples of attempts to extract pattern from the archaeological record and assess the success or failure of these attempts.

Equally important in studies of pattern is the recognition of various culturally induced processes that shape and transform the life cycle of material items as they make their way through a cultural system. We discuss these processes and briefly touch on various recovery biases that can affect evaluation of patterning in the archaeological record. We focus the discussion on ceramic materials, realizing that ceramics are only part of an archaeological assemblage and that many of the processes that affect ceramics may affect other material classes as well.

The second part of this section examines case examples in which archaeologists have moved beyond pattern recognition and have used pottery to derive and test generalizations about human behavior.

Pattern Recognition

Pattern recognition can have spatial connotations, identifying the distribution of items across space, as well as content connotations, identifying either the presence or absence of items or their frequencies or percentages within an assemblage. Although spatial analysis is an important exercise in historical archaeology, we limit our discussion to analysis of content, focusing on ceramic items. There is a third aspect to pattern, the covariation of attributes, which was dealt with in an earlier section of the paper. This aspect interweaves itself with content and essentially forms the basis for content-based pattern recognition studies (see South 1977b).

Ceramic materials have played important roles in the development of pattern recognition studies for several reasons. First, ceramics are fairly durable substances that last in the ground. Second, they were widely used commodities in North America by the second half of the eighteenth century, especially after the advent of inexpensive English cream-colored ware. Third, archaeologists have realized that ceramics can be used to make inferences about select aspects of human behavior, including how goods flowed into and through colonial frontier society.

Patterns of content usually are observed by calculating frequencies and percentages of ceramic taxa, whether these are based on ware, decoration, function, or value. Frequency or percentage variability then can be examined on a feature-by-feature basis or on an intersite basis. Most historical archaeological reports completed prior to about 1970 were site specific, in part because so few historical sites had been excavated. In a few cases (e.g., Miller and Stone 1970), reports attempted to relate assemblage compositions to trade networks or to time-and-space-specific events, but few were able to escape either the normative framework of the "ordinary site" or the particularizing framework of the "single event."

The backlash to normative archaeology that occurred in the 1960s, with a new orientation toward quantification and explanation, caught up with

historical archaeology late in the decade. The leading proponent of this shift was South, whose influence in the field was felt widely. He in turn was greatly influenced by Binford, whose venture into the field of historical archaeology (e.g., Binford 1962a, 1972a,b; Binford and Maxwell 1961) was coupled with his more general calls for anthropological archaeology, and later by Schiffer, whose identification and definitions of contexts, transformations, and modes of disposal (e.g., Schiffer 1972, 1973, 1976, 1977, 1983) presented a body of midrange theory from which to examine archaeological patterning.

South (1977a,c, 1978a,b) amassed considerable quantitative data relative to the proportions of various artifact functional groups (e.g., kitchen and architectural items, arms, and furniture) that occurred at sites that were known from historical documents to have had different cultural and functional associations. He used data from posited functionally similar sites to define patterns that he and others have used predictively in situations where cultural and/or functional associations were unclear. The patterns he defined, for example, the Carolina artifact pattern and the frontier artifact pattern, were developed originally to integrate data into reflections of cultural patterns in the British colonial system (South 1977a,b:2), though their use has been extended well outside that range.

The basic assumption behind South's work is that the patterning evident in archaeological assemblages reflects part of a world system oriented toward the exploitation of new lands. Such a pattern should show up in an archaeological site regardless of where, for example, a British social group happened to settle. Specifically, South (1977a:86) states that "each household in an eighteenth-century British colonial society represents a system within a much larger system of complex variables, with the larger system imposing on each household a degree of uniformity in the relationships among its behavioral parts." He also states (p. 88) that (1) "British colonial behavior should reveal regularities in patterning in the archaeological record from British colonial sites"; (2) "specialized behavioral activities should reveal contrasting patterns on such sites"; and (3) "These patterns will be recognized through quantification of behavioral by-products which form the archaeological record."

This view of culture is difficult to characterize as being normative or systemic (cf. Warfel 1982). Although it emphasizes variability in the archaeological record, it searches for broad, mainstream cultural patterns. It also tends, however, to ignore the social and physical environment that sets limits or conditions on human adaptation. The approach was criticized by Warfel (1982) and Severson (1983) because

1. it fails to use documentary evidence to control for variation in site function.

2. it abstracts patterns that are as much a product of the artifact classification scheme as they are of the cultural system.
3. the patterns are never refined.
4. in general, the patterns do not explain variability

As we point out below, some of these criticisms no longer are valid. Recent advances have been made, for example, in the refinement of the patterns recognized by South, and more are sure to follow.

South's work on the Carolina and frontier archaeological pattern spawned a large number of similar studies and a host of new patterns: for example, the early fur-trade artifact pattern (Beaudry 1982; Forsman 1983), the upper South pattern (Majewski and O'Brien 1984; O'Brien *et al.* 1982), the initial European farmstead pattern (Benson 1978), the public-structure pattern (Wise 1978), the Carolina slave artifact pattern (Garrow 1981; Wheaton *et al.* 1983), and the public-interaction pattern (Garrow 1982). Earlier attempts at pattern recognition often failed to take into account the technological, sociological, and economic conditions of both the region that produced the settlers or colonizers and the area that received them, but in many cases later readjustments corrected these deficiencies (see Garrow 1982, for example).

There are, however, examples in which the economic and social history of a region or group has been well developed but where the archaeological record is used rather naively. Our own work is a case in point. Although we believe (1) our model of the colonization of the central Salt River valley of northeastern Missouri and of the subsequent spread of settlement and (2) the tests of the model were well grounded both theoretically and methodologically, our early attempts to elicit patterning from the archaeological record (O'Brien *et al.* 1982) were rather simplistic and without much merit. Hopefully, we are well on the way to correcting this deficiency (Majewski 1987; Majewski and O'Brien 1984) through more careful consideration of what it is that the artifact assemblages are reflecting.

Two other aspects of pattern recognition must be addressed, both of which involve sampling strategy. South's (1977a) original formulation of the Carolina artifact pattern, for example, was based on materials recovered from excavated structures, outbuildings, and middens (see also South 1978a,b). Intervening areas were not sampled, making it difficult to assess the representativeness of the materials. The problem of sampling suggests that one type of patterning, such as the Carolina artifact pattern, could be identified from excavations within a structure, while another pattern, such as the frontier artifact pattern, could be identified from excavations between structures (cf. Lewis 1977:192). The ability to abstract meaningful patterning is only as good as the sampling design that produces the material items. Intuitively based sampling units do little to bolster one's confidence in the analytical results.

The sampling problem is related directly to another problem, one to which we alluded earlier and one that plagues pattern recognition studies in general: blind assignment of assemblages to artifact patterns without proper regard either for site function or for the sociocultural system of which the assemblages are reflections. Garrow (1981) and Wheaton *et al.* (1983) tackle this problem in an analysis of plantations in South Carolina, using well-reasoned arguments and documentary data to adjust the classes used in South's (1977a) Carolina pattern to derive what they term the "Carolina slave artifact pattern" (see also Garrow 1982:57-59). Their work is important because it is an attempt to develop solid reasons for adjusting South's classes, reasons built on an in-depth knowledge of the historical record.

Another example of well-reasoned modifications is provided by Benson (1978), who examined the reversal in percentages of certain artifact classes in South's frontier and Carolina patterns. She suggests that the differences might be explained either by the factor of "domesticity," that is, whether a woman was present on a site, or by a homestead's access or lack of access to economically viable markets (see also Adams 1976; Gaw 1975; Miller and Hurry 1983). Benson compared assemblages from a post-1790 farmstead in the Netherlands Antilles and a post-1810 farmstead in Ohio and demonstrated close relations between artifact class percentages and those used by South (1977a) to create the Carolina pattern. She suggests both that the pattern, which she renamed the initial European farmstead pattern, had its roots in northwestern European medieval tradition and that South's Carolina and frontier patterns are offshoots of the same general pattern. The former will occur at sites occupied by a European man and his wife, while the latter reflects the presence of a man or of a family that lived on a site for only a short time.

Patterns and Process

When using material classes to study archaeological patterning, it is important to recognize that the presence of an item in a cultural system is related directly to a host of factors, including household size and composition, the ability to purchase an item, the availability of an item, the intended function of the item, and the actual or perceived need for the item (Deetz 1973; LeeDecker *et al.* n.d.; Schiffer *et al.* 1981). Although together these topics form a concise framework for discussion, they cannot be divorced from certain culturally induced processes that not only shape the life history of an item but that, together with natural processes, contribute to the removal of objects from systemic contexts and lead to their entrance into archaeological contexts.

Schiffer (1972, 1973, 1976, 1977, 1983) has discussed in detail various culturally induced processes that contribute to the formation and

modification of archaeological deposits as objects move between systemic contexts and archaeological contexts. Inherent to these discussions is the classification of activities that either contribute materials to the archaeological context (e.g., loss, discard, and abandonment) or remove materials from the archaeological context (e.g., scavenging). A second classification considers activities that move materials from one systemic context to another (e.g., recycling, secondary use, lateral cycling, and conservatory processes). These activities constantly act on an item during its life cycle, especially relative to the aspects of need and function. We examine these activities, or processes, below by constructing a simple flowchart of the life history of ceramic materials found in nineteenth-century contexts. We frame the discussion around the topics of availability and introduction of goods into the marketplace, need, function, and behavioral aspects of vessel ownership and use.

Availability and Introduction of Goods. The life cycle of a ceramic object begins with its manufacture, which, for most nineteenth-century materials, was accomplished under rigid, formalized production standards. The next step in the cycle is the shipment of the item, either directly to the consumer or to a middleman (e.g., to a wholesaler, a jobber, a showroom, or a merchant) (Miller 1984b). Most nineteenth-century refined earthenware purchased and used in North America was made in England (Miller 1984a). U.S. Department of Commerce (1915) records show that there were more than 300 individual potteries operating in six towns around Staffordshire known as "The Potteries." In the 1850s the Staffordshire potteries exported more than one-third of their wares to the United States (Godden 1972:7), and by the early 1900s the figure had risen "to 90% of their best wares," despite a series of restrictive tariffs (U.S. Department of Commerce 1915:394).

Although her topic is British tableware from a military post in New Brunswick, Canada, Sussman (1978) develops a number of propositions regarding ceramic availability that probably have wide applicability. She notes that although each regimental mess acquired its tableware independently, the exigencies of the long distance between manufacturing or retail sources led to a homogeneity in military tableware from post to post. She also states that "The thousands of other ceramic objects found at these sites are indistinguishable in ware types, function, or decoration from those found in civilian settlements" (p. 93). Miller (1984b:45-46) wonders "whether the merchants themselves could have distinguished differences among each other's stock."

During the late eighteenth and early nineteenth centuries, London warehouses sold large quantities of pottery from numerous factories, even when the warehouses were owned by one factory (Whiter 1970:15-16). Although sets ordered from a warehouse probably were composed of individual pieces from multiple factories, the ability of English potteries to produce a product fairly consistent in shape and glaze color resulted in homogeneous sets of dishes. Much of this merchandise may have consisted of seconds, pieces with tiny flaws that probably could be purchased at reduced cost (Griffiths 1978), but to the typical consumer this was acceptable. Because of a fairly high rate of breakage, the majority of patterns purchased by the ordinary consumer (military as well as civilian) would have been common patterns and wares, items that could easily be replaced and were not susceptible to sudden changes in popularity (Sussman 1978:101-102).

Ceramic sets, made only sporadically during the eighteenth century (Miller 1980:13), became popular during the nineteenth century (cf. Garrow 1982:107). However, there is considerable evidence that even during the first quarter of the twentieth century, especially in remote areas, consumers may not have been too concerned with the purchase of sets. For example, Gaw's (1975) analysis of ceramics from the 1900-1930 community of Silcott, Washington, suggests that although a wide range of ceramics was available in the Pacific Northwest, complete sets may have been rare. Residents apparently had few qualms about purchasing unmatched pieces, focusing on the intended function of a piece rather than on its decoration.

Early points of wholesale pottery distribution in the United States were at Baltimore and Philadelphia, but by the 1840s New York began to exert considerable pull on the market (Atherton 1971:83). In eastern Canada, Halifax was an early distribution center, but Montreal, located on the St. Lawrence River, was the major commercial market during the nineteenth century (Collard 1967:11).

In the Midwest, St. Louis had a unique potential for development as a mercantile center, being located on the only line of transportation to the regions along the upper Missouri and Mississippi rivers and their major tributaries such as the Illinois and Red rivers (Atherton 1971:95; Taylor 1951:64). We can examine the role of St. Louis in the ceramics trade to develop some understanding of how items were distributed to a newly settled area.

Many areas of the Midwest were settled after about 1810 by Kentucky and Tennessee emigrants who had participated in an international trade system that imported manufactured goods from England by way of Philadelphia and eventually down the Ohio River. Merchants who immigrated to the Midwest probably continued to favor Baltimore and

Philadelphia as their purchasing centers. The frontier period of merchandising was characterized by retailers who were separated by great distances from the wholesalers on which they relied, and as a rule, only one large order was placed each year, which necessitated large capital outlays and substantial risk. Many storekeepers traveled to the East to buy from wholesalers directly, risking the dangers of river transport. By 1840, local wholesalers began springing up in the South and Midwest, acting as middlemen between the large Eastern importers-wholesalers and the frontier retailers (Atherton 1971:67-71).

During the 1840s and 1850s, a tremendous growth in steam navigation occurred in the region controlled by St. Louis as a wholesaling center. Wholesalers, who either traveled to the East or bought directly from established European contacts, received their goods quickly (Atherton 1971:95-96). American wholesalers often arranged for a British pottery to have the wholesaler's name printed on the vessels they imported (see examples of such marks in Majewski and O'Brien 1984), a practice that resulted in a permanent record for the archaeologist. Pieces backmarked with the names of large St. Louis wholesalers are ubiquitous in the Midwest (DeBarthe 1979; Majewski and O'Brien 1984; Price 1979; Steinacher and Carlson 1978; Waselkov 1979).

The years 1847-1854 saw a transportation revolution in America (Chandler 1965:137-138). By 1854 railroad lines had opened from Pittsburgh and Wheeling to Cincinnati and Louisville, and to St. Louis by 1857. Before the end of the decade, steamboat passenger traffic on the Ohio was seriously reduced, and freight rates had to be slashed drastically. Steamboat travel and trade were kept alive somewhat longer on the upper Mississippi River and its tributaries as railroads transported large numbers of settlers and briefly stimulated river trade. The era of frontier merchandising was nearly at its end. Although English goods would still figure significantly in the import market, their dominance was being challenged by a number of factors, including the development of American industry and competition from other European manufacturing countries (Chandler 1965:141; U.S. Department of Commerce 1915). Retailers in the upper Mississippi region and in areas along its tributaries no longer had to rely on yearly purchases from the East; they could order shipments as needed for delivery by rail (Atherton 1971:98).

It is not coincidental that post-1850 assemblages from many areas of North America are relatively homogeneous. The same major classes of ceramics appear repetitively from site to site, albeit with some variation in percentages. Despite some regionalism in backmark distribution, indicating that wholesalers in certain regions dealt with select potteries, the similarity in decoration points out that the English potteries knew exactly what American consumers wanted and mass produced items for quick sale.

Brose (1967:11-12) notes that, at least in the East, the development of railroad transportation had, by about 1875, put an end to regional ceramic complexes, as virtually every group of people had access to the same range of material imported from England.

Although the English monopolized the pottery trade well into the twentieth century, the postbellum period witnessed a slight respite from the near stranglehold the English potteries enjoyed during prior periods, as American companies began making inroads into some geographic regions after the Civil War. Over much of the midcontinent, marked archaeological specimens primarily are from companies located in the core ceramics-producing area centered in and around East Liverpool, Ohio. Although St. Louis lost some of its position as a major wholesaling center after the advent of the railroad, it almost certainly maintained some importance as a major distribution center for items from major production areas such as East Liverpool, relying on networks set up during the commercial heyday of the city.

The presence in ceramic assemblages of marks that belong to smaller American potteries points to the much wider range of products being marketed in postbellum times. This increased variety in type of wares, as well as in the points of origin, makes it difficult to provide a comprehensive taxonomy of pottery produced after the Civil War, even though the more easily classified products of English ceramics manufacturers figured importantly on the scene at least until the early 1900s.

Although a knowledge of regional commercial networks is integral to the study of patterning in the archaeological record and certainly is a step ahead of a focus only on local commerce, the true picture can only be understood if a wider approach is adopted. So far, this kind of approach relative to ceramic commerce is almost nonexistent in archaeological studies. Most studies begin with the arrival of pottery in the United States, the underlying assumption being that the flow of pottery from England to North America during the eighteenth and nineteenth centuries was a steady, uninterrupted phenomenon. Forgotten is the fact that trade between the United States and England was disrupted or terminated several times between 1770 and 1815, which had dire consequences on English potteries, as one of their major consumers shopped elsewhere for goods.

Need. Need is a difficult factor to quantify, and in some respects it cannot be separated from availability and function (Deetz 1973:19). It also is difficult to separate need from preferences and social status, since a person may believe he or she needs something, when the need is not for physical well-being but rather for psychological well-being. Beaudry (1978), for example, discusses the role of tea drinking in eighteenth-century England, a

custom that often was (and still is) of ceremonial proportions (cf. Roth 1961). In examining English estate inventories for the period, she found that pieces in tea sets often did not match, leading her to conclude that "The desire to be able to assemble an entire tea service sometimes surpassed the desire for *matched* services" (p. 202).

Deetz (1973:19) states that although an item might be obtained easily, it might not be needed. For example, wooden vessels could have served in place of ceramic vessels. While it is safe to assume that nineteenth-century households could have used wooden or metal vessels for food preparation and eating, and undoubtedly did in some cases (e.g., Miller and Hurry 1983), the ubiquity of ceramic vessels suggests they were "needed" items.

The blurred distinction among availability, need, preference, and use-life of ceramic vessels is illustrated in the assemblage from Johnny Ward's ranch in southern Arizona, occupied between 1859 and 1903 (Fontana and Greenleaf 1962). Eighty-one percent of the sherds were of ironstone, though a wide variety of ceramics apparently was available to the occupants if they had desired them. The dominance of ironstone led Fontana and Greenleaf (1962:92) to conclude that the "remarkable" qualities of ironstone, especially its ability to withstand rough transport, made it an attractive ware for use in the western frontier.

Function. After items are acquired, they become outward expressions of the social systems in which they are used. Pottery serves more than a techno-functional (Rathje and Schiffer 1982:65) role [Binford's (1962b) technomic function], though this aspect of pottery use is the simplest to study. Pottery can also play socio-functional and ideo-functional (Rathje and Schiffer 1982:65) roles [Binford's (1962b) sociotechnic and ideotechnic functions], an example of the former being a plate displayed on a mantel and of the latter being a ceramic holder for a votive candle.

Two problems that arise in assessing vessel function are (1) the plethora of names used in print to refer to different types of ceramic vessels and (2) an equation of vessel form with vessel function. The first problem is not as great for late eighteenth- and early nineteenth-century materials as it is for earlier material (Beaudry *et al.* 1983), though the problem persists. By the second decade of the nineteenth century, glassware was beginning to make inroads into some of the functional classes previously dominated by pottery, such as beverage containers. This resulted in a reduction in the number of ceramic forms and perhaps in a standardization of forms intended for various functions.

There often is reason to suspect that vessels were used for purposes other than those the potter intended, especially in cases where an item has been

altered, either by accidents or on purpose. There may also be reason to suspect that a vessel, though perfectly capable of being used as a technofunctional item, never was used as such, or only rarely so. For example, Deetz (1973:33) found pearlware and creamware plates in the refuse from a Plymouth, Massachusetts, household, but the creamware vessels showed no cutlery-induced use marks. Based on this evidence, Deetz infers that, at least in one household, creamware was reserved for special occasion service. We examine the conservation of items in more detail later.

The consumer is an active agent in determining the function of an object, regardless of the function intended by the producer: "Thus problems of multiple use of an object and the substitution of one functional shape for another (usually a result of the scarcity of certain functional shapes) are critical problems to be considered within site interpretation" (Griffiths 1978:68). To overcome these problems, Griffiths used detailed observations of residual use marks on ceramic items, derived through comparisons with use marks of known origin, to arrive at interpretations of vessel function. Her detailed characterization of knife- versus spoon- or fork-induced and utensil- versus storage- or stacking-induced wear has wide applicability.

Behavioral Aspects of Vessel Ownership and Use. Two behavioral aspects of vessel ownership and use, the processes of secondary use and recycling, play important roles in structuring the systemic context of which pottery is a part. They also have an effect on the archaeological record by keeping materials out of an archaeological context. Some ceramic items can serve more secondary uses than can others. For example hollowware items such as bowls and cups can be used as dippers or containers if the handles break, whereas a broken plate may have little further utility. Vessels also can be mended (e.g., South 1968), thus keeping them in the system. Miller and Hurry (1983) cite a description of tableware as noted by an early nineteenth-century traveler through the Western Reserve area of Ohio, a description that probably typified the condition of many frontier household ceramic vessels:

Many people brought here with them a good supply of good crockery, which is mostly broken, and its place partially supplied with very indifferent ware. Many broken-nosed tea pots are to be seen, and others without a handle, the use of which is supplied by means of a bail made of iron. (Hawley 1822:44)

Recycling of ceramic items could include the use of sherds as gaming pieces or ornaments, especially in situations of culture contact between Native American and European groups (e.g., Smith 1972:Figure 46p-t).

Lateral cycling, the exchange of an object between one user and another (Schiffer 1972), could include the purchase of a set of dishes at an auction, the simple exchange of items between individuals, or the giving of gifts

within and between distinct social units (see Schiffer *et al.* 1981). In many instances lateral cycling is difficult if not impossible to identify archaeologically. Perhaps the most visible situation is between-group exchange, especially when the social distance between the groups is great. Regarding ceramics, or for that matter most other material classes, we could propose that persons or households of higher social status will own more elaborate or costly items than will lower-status persons or households. Once items within a material class have been scaled in terms of cost or elaborateness, assemblages can be searched to determine where on the scale the majority of items within that class fall. Close inspection of aberrant objects would then follow to determine the reasons behind their occurrence. Support for possible interpretations might come from historical or archival information.

Archaeological evidence of between-group cycling is widespread in investigations of plantations and slave-occupied or free black-occupied sites. For example, Otto (1984) found matches in surface patterns on tableware pieces from slave cabin refuse and tableware from refuse around the planter's kitchen area at Cannon's Point Plantation, Georgia. Smith (1976) found a similar situation at the site of the first Hermitage in Tennessee. Baker's (1978) reanalysis of Bullen and Bullen's (1945) work at Black Lucy's Garden in Andover, Massachusetts, suggests that the presence of mismatched pieces of fairly expensive pearlware and creamware items and the high frequency of tea-set pieces was a result of gifts from wealthier whites to an impoverished free black woman. Obviously, considerable care must be exercised when making such an assumption, since lateral cycling may have nothing to do with the case at hand. For example, Miller (1974) and Geismar (1982) suggest that piecemeal accumulation of ceramic items may reflect the buying habits of economically marginal people, based on the recovery of large assemblages of mismatched vessels from free black sites in Maryland and New Jersey, respectively. Such an assumption must be made with care, however, since access to markets may also impose limits on what is available in an area (see Gaw 1975 for such an example). We return to the issue of ethnicity, social and economic status, and resulting archaeological patterns in a later section.

Conservation of ceramic items could result from several activities, most notably the use of such items as decorations, all of which could result in much older material being added to the archaeological record. There is no reason to believe that heirlooms were not treasured during the early nineteenth century (cf. Bridges and Salwen 1980:44; Dyson 1982:372), and it is not uncommon to find pieces from this period or earlier periods in nineteenth-century contexts. Griffiths' (1978) work with use marks suggests that close examination of lower plate rims (that portion of the rim directly below the center design when held in an upright position) and portions of

plate footrings can reveal abrasion marks from plate display rings. The aforementioned occurrence of special-occasion creamware at Plymouth (Deetz 1973) is another example of conservation.

Vessel Discard. There is a pattern to discarding by-products of human behavior around an occupation site that "might be viewed as a per capita, per year contribution to the archaeological record" (South 1977a:87). Broken ceramics represent remnants of activities that the archaeologist hopes to identify, though the quantity of remains resulting from any activity does not necessarily parallel the importance of an activity within a cultural system. It does, however, correlate directly with the remains of other activities (cf. Deetz 1977). "It is these relationships among the by-products of human behavior that might be expected to reveal regularity when compared on an intersite basis" (South 1977a:86).

Broken pottery vessels—by-products of food preparation, storage, and consumption—can find their way into a variety of places, including yards, areas beneath houses, cellars, ditches, abandoned wells and cisterns, and privies. A nonstatistical perusal of the historical archaeological literature strongly suggests that features deliberately excavated for trash containment are rare occurrences. Trash repositories can contain primary refuse, trash discarded at its location of use (Schiffer 1972), or, more probably, secondary refuse, trash discarded away from its area of use. A third type of refuse, rare in comparison to the aforementioned types, is *de facto* refuse (Schiffer 1972): materials that, though still usable, are abandoned. Some researchers (e.g., South 1977a; Tordoff 1979) have created a fourth type, primary *de facto* refuse, to define items that progress "from the systemic context to the archaeological context . . . with no intervening process of accumulation and removal" (Tordoff 1979:43). This type of refuse usually is composed of small items, such as pins or shot, that are capable of falling through small crevices or slits between floorboards and that either are not recoverable or are not worth the effort. Ceramic items rarely would fall into this category.

The most difficult archaeological situation occurs when a site has been occupied over many years, perhaps by persons of different ethnic or social groups, and areas around a residence have been cleaned of refuse and additions made to the structure. In such a situation, we would expect to find the types of refuse mentioned above, as well as secondary refuse that has been moved a number of times. There are many references (e.g., Majewski 1987) to inverted stratigraphy in trash-filled subterranean features (e.g., privy pits, wells, and cellars), where earlier materials are collected from one area and deposited in another. If rooms or sheds are added to a structure without first cleaning the ground surface, however, the additions can seal the deposit, provided the perimeter under the sills is solid, thus preventing the

addition of refuse. If the date of the addition is known from documentary or oral sources, then an absolute ending date can be placed on the deposit (e.g., O'Brien *et al.* 1982).

Privy pits constitute another set of contexts that often offer the opportunity to examine consumption and discard behavior. LeeDecker *et al.* (n.d.) state that fecal fill deposits often produce the best assemblages for studying household behavior (cf. Cressey *et al.* 1982; Klein and Garrow 1984). By "best" we assume they mean stratified assemblages from a small, restricted space.

In summary, the cultural processes that form and transform the ceramic portion of the archaeological record are diverse and, in many instances, are difficult to pinpoint. In the long run, however, more effective use will be made of the archaeological record if we

1. are aware of how ceramic materials are introduced at a site
2. employ classification systems that are appropriate for the type of investigation being conducted
3. are cognizant of possible differences between vessel shape and intended or actual vessel function
4. take into account the processes that act upon an item as it proceeds through the cultural system

Without an awareness of these issues and control over the factors that shaped both the systemic and archaeological contexts of material items, attempts to formalize general statements about behavior can produce spurious results. Worse, such results may become accepted as "fact," and other assemblages will be searched for similar patterns and then "explained" through references to their similarity to the established pattern.

Behavioral Generalizations

There is an ever-increasing number of studies in which a wide range of data is being brought to bear on issues concerning the behavior of humans in the nineteenth-century cultural milieu of the United States. Important components of many of these studies include ceramic materials and contemporary documentary information on the manufacture and marketing of ceramics. We examine several such studies in this section but in no way suggest that our survey is exhaustive. Rather, we employ the studies as examples of the kinds of behavioral issues that can be addressed by using ceramics as an integral component of analysis.

One promising area of research is the study of ethnicity, occupation, and status through the analysis of ceramic materials. Dozens of such studies have appeared over the past few years (e.g., Cheek *et al.* 1983; Felton and Schulz 1983; Henry 1986, n.d.; Henry and Garrow 1982a; Henry *et al.*

1983; Klein and Garrow 1984; LeeDecker *et al.* n.d.; Saunders 1982; Schuyler 1980; Spencer-Wood n.d.a), many of which use Miller's (1980) ceramic indices as occupational or status indicators. The proposition behind these studies is that variability in the mean value of ceramic assemblages correlates directly with variability in status and, concurrently, in occupation. These variables together form a hybrid variable that can be termed "economic position" (Spencer-Wood n.d.b:7).

The majority of studies employing Miller's scheme have relied heavily on documentary information as an independent means of evaluating the position of a site's inhabitants on the ceramic scale, and several have shown that other factors besides economic position have affected consumer choices and thus the composition of ceramic assemblages. For example, Miller and Hurry (1983) found that the ceramic assemblage from the farmstead of a farmer in the Ohio Western Reserve (1800-1825) did not fall where documentary evidence of his fairly high wealth would have suggested. They attribute this to the difficulty of market access in the area prior to construction of the Erie Canal in 1825.

In an important study that sheds considerable light on the relation between economic position and ceramic inventory, vis-à-vis the ceramic index, Spencer-Wood and Heberling (n.d.) compared several sites from various areas of the United States and found that with one exception (the Ohio Western Reserve site) socioeconomic status was the prime source of variability on the ceramic scaling. They also note that the ranking of sites by teaware values "seems to be much more accurate than ranking them by flatware or bowl values, and even more accurate than ranking them by total assemblage values" (p. 28). Thus, "this relationship may often permit the inference of the relative value of ceramic assemblages, especially teaware, when documentary data are not available" (p. 28). Spencer-Wood (n.d.b), however, cautions that the range of applicability of the method is still unknown, and situations need to be identified in which ceramic choices are controlled by factors other than occupational status, factors such as ethnicity, religious affiliation, market access, and family size and structure.

One source of inspiration for studies of ceramics and socioeconomic position is Otto's (1975, 1977, 1984) analysis of Cannon's Point Plantation in coastal Georgia, one in a series of studies inspired by the earlier work of Charles Fairbanks (e.g., Ascher and Fairbanks 1971; Fairbanks 1974, 1984). Using architectural, faunal, and ceramic data, Otto was able to infer status differences among planters, overseers, and slaves as the statuses were reflected in differential access to food and material items. The key to Otto's study was the use of documentary information, which established controls over ethnicity, status roles, occupation, and time. By holding status as a known constant (he was able to identify through records the planter's house, the overseer's house, and the slave cabins), he then could demonstrate how

status differences and differential access to material goods patterned the archaeological remains. [Orser (n.d.), however, argues that the positions of slave, overseer, and planter should be regarded as segmented labor positions because of the economic orientation of plantations. Under such a view, assemblage differences are seen in economic terms rather than in ethnic terms.]

Documents suggested to Otto that several kinds of status patterning could exist in the archaeological record: (1) a white dominance pattern, reflecting the higher racial and legal status of the planters and overseers; (2) a hierarchical pattern, reflecting known social or occupational divisions among the three groups; and (3) a wealth-poverty pattern, reflecting the affluence of the planters and the relative poverty of the overseers and slaves (Otto 1984:160-161). Architectural analysis demonstrated that the planter's and overseer's houses were built to last, though the planter's house was about 2.7 times the size of the overseer's house. The excavated slave cabin was 2.3 times smaller than the overseer's house and was little more than a shanty. Thus the evidence revealed both white dominance patterning (substantial versus nonsubstantial housing) and hierarchical patterning, with blacks on one end of the scale, white overseers in the middle, and white planters on the other end. The plantation owners had ready access to beef and mutton, as well as to wild game and fish from habitats not exploited by the slaves and overseers. Importantly, cow bones from around the planter's house exhibited evidence of saw marks from the preparation of roasts, while butchering marks on bones from the slave and overseer's quarters were exclusively from cleavers, indicating that the meat and bones were used in soups and stews. Otto took this as support for his thesis that wealth patterning would be evident in plantation assemblages.

Ceramic items figured significantly in Otto's analysis, in part because of his desire to test Miller and Stone's (1970:100) assumption that one can infer "the relative socioeconomic level of a population and define any major status differences which existed at a site by means of the distributional analysis of ceramics." Otto (1984:165) notes correctly that this assumption rarely had been tested prior to his work.

Despite the fact that nineteenth-century English pottery was fairly inexpensive and most vessel forms were readily accessible in the South, there were significant differences among the three assemblages at Cannon's Point. At the slave and overseer sites banded, edge-decorated, and undecorated earthenwares composed about 70% of the sherds, but those three classes constituted only 12% of the sherds in the planter assemblage. Eighty percent of the planter assemblage was composed of transfer-printed sherds, which is in line with Miller's (1980) economic scaling of eighteenth- and early nineteenth-century pottery.

Following South's (1972a:99) suggestion that vessel shape rather than

type (decorative or ware-based) may be a "more sensitive indicator of *function* and possible socioeconomic level," Otto examined form variation across the assemblages. Higher percentages of storage vessels (jars and jugs) occurred in the planter assemblage than in either of the others, and the lowest percentage of tableware occurred there as well. Neither pattern is discussed further by Otto. On first glance, it would appear that slaves and overseers enjoyed more use of tableware than the landowners because of the higher percentage of tableware in the two assemblages (64% of the slave assemblage was tableware, compared with 58% for the overseer and only 52% for the planter). The same is true for tea and coffeeware, which appears in greater percentages in the overseer assemblage (31% of all vessels) than in the planter's assemblage (27%). It must be remembered, however, that these percentages reflect household-level *discard* rates and may not be accurate reflections of relative popularity. Also, the percentages are misleading in that they hide the significant difference in numbers of vessels recovered from the planter's kitchen (309) versus the numbers from the overseer's house (135) and the slave cabin (126).

Several sherds from the slave cabin could be matched with sherds from the planter's kitchen, indicating some degree of lateral cycling. The majority, however, did not match, leading Otto (p. 61) to infer that the slaves were either buying their own ceramics or were having their items supplied by the owner. If so, then the owner was furnishing the slaves with a mixture of ceramic patterns, perhaps purchased in odd lots (Otto 1984:667), since over 30 different transfer-printed patterns were recognized from a total of only 154 transfer-printed sherds (Otto 1977:Appendix C). These totals were in marked contrast to 60 different patterns from a total of 1520 transfer-printed sherds in the planter assemblage (Otto 1977:Appendix C).

Several points of caution can be derived from Otto's study that are relevant to the use of ceramics to study status and economic position. First, in the absence of documentary information, ceramic data should be used with extreme caution. Second, plantations were specialized institutions that were unlike the outside world, and material items were not introduced and circulated under the same set of norms that existed outside the plantation. Third, and in this same vein, it is difficult to untangle the social complexities of plantation society and to address separately the issues of ethnicity, economic position, and status (cf. Orser n.d.). We return to this point below.

Perhaps the most interesting aspect of Otto's work is his analysis of tableware forms and the meshing of resulting information with data from the faunal analysis. At the planter's house, over 80% of the tableware vessels was composed of serving flatware such as plates, platters, and soup plates. Bowls composed only 8% of the vessel assemblage. At the overseer's house, bowls made up almost 25% of the assemblage, and at the slave cabin they composed over 40%. Transfer-printed flatware composed over 60% of

the tableware from the planter's house, 28% from the overseer's house, and only 11% from the slave cabin. In contrast, banded bowls made up 29% of the tableware from the slave cabin, 17% from the overseer's house, and only 6% from the planter's house. Otto (1984:167) correlated the hierarchical patterning in ceramic shapes and forms with differing functions of vessels in the food systems of the three social classes. Members of the planter's family were eating roasts served on transfer-printed platters, supplemented with tureens of vegetables and soups. The overseer's family and slave families were eating slow-simmer foods served in bowls.

The patterns in ceramic assemblage composition noted by Otto have been duplicated at other black-occupied sites such as the slave quarters at Andrew Jackson's Hermitage Plantation, Tennessee (S. Smith 1976, 1977), and Castalian Springs, Tennessee (Smith 1975), and the free black sites of Black Lucy's Garden, Massachusetts (Baker 1980), and Parting Ways, Massachusetts (Baker 1980; Deetz 1977). These similarities led Otto (1984:174) to conclude that "The comparative evidence from the antebellum New England free black sites suggest that one-pot, slow-simmer meals were not confined to the black slaves of the Old South who lacked both cooking utensils and the time for food preparation."

That the basic findings of Otto's work have been duplicated at other antebellum Afro-American sites suggests that the findings might cautiously be extrapolated to undocumented sites. However, Otto echoes Baker's (1980) caveat that the archaeological remains from lower-class Afro-American sites "should be compared with those from lower-class Euro-American sites to determine whether such characteristics as serving bowls, chopped food bones, and one-pot meals are the result of race or class" (Otto 1984:175). The problems involved in separating "race from class," that is, ethnicity from socioeconomic position, are many, due in large part to the nonindependence of the two concepts. One can soon become mixed in the dilemma of trying to decide whether a ceramic assemblage (irrespective of its context) is a reflection of access, of ethnic preference, or of some other factor or factors.

Geismar's (1982) analysis of Skunk Hollow, a nineteenth-century rural black community in New Jersey, further supports the notion that ethnicity may at times be suppressed by other factors in forming patterns of behavior. Her study of ceramic materials suggests that although they were poor, Skunk Hollow's blacks were more prosperous than the free black woman who inhabited Black Lucy's Garden or (not surprisingly) the slaves at Cannon's Point Plantation. The rise socially and economically of the Skunk Hollow population apparently was tied to the leadership of the ranking member of the community, a minister, and its decline was tied to his death or later inactivity. Geismar used Miller's (1980) ceramic-value index and Otto's (1984) comparison of relative proportions of transfer-printed

pottery and its correlation with banded wares to scale several artifact clusters in terms of wealth. She found that not only were there status differences among clusters but also status shifts over time.

Significantly, at Skunk Hollow bowls composed only 20% of the tableware assemblage, which is considerably lower than that found at the other black-occupied sites discussed so far. [We note that Otto (1984) states that bowls made up 29% of the *tableware* but over 40% of the *assemblage* at Cannon's Point slave cabin. Baker (1978:112) speculates that "the presence of serving bowls exceeding 40% of *all tableware* . . . appear[s] distinctive of Afro-American sites, both slave and free" (emphasis added).] Geismar (1982:155) suggests that the difference in percentages may be an effect of time differences or it may reflect the independent economic status of the Skunk Hollow populace. The difference also might be an effect of acculturation to white foodways, as was noted for black families in Quander Alley, southeast Washington, D.C. (1890-1940) (Cheek and Friedlander n.d.; Cheek *et al.* 1983).

The archaeology of sites occupied by lower-status whites has been slow to develop, and although the advent of cultural resource management studies has modified this imbalance, broad patterns have yet to emerge. One particular study, though incomplete, appears to hold some promise for understanding aspects of frontier colonization by, and settlement processes connected with, lower-status whites. The study focuses on the eastern margin of the Ozarks in southeastern Missouri and encompasses the years 1810-1870 (Price 1979; Price and Price 1978, 1981). Ceramic material was used to position sites temporally and to make intersite comparisons.

With one exception, the sites produced low percentages of annular-banded bowls (less than 5%) and large percentages of plates, saucers, and cups. The site that produced 10% banded bowls was not a slave site (Price 1979:32). Edge-decorated vessels regularly contributed at least 20% of the eight assemblages examined, with sponge- or spatter-decorated vessels appearing frequently in the later portions of the assemblages. Transfer-printed vessels usually contributed less than 20% to any assemblage, except for the Widow Harris site, which contained approximately 60% transfer-printed wares.

The pattern that emerges from the southeastern Missouri study is one in which relatively poor Eastern emigrants gained a foothold in a new environment and within a few years of arrival developed a loosely based social hierarchy that in some respects has continued relatively unchanged into modern times. Importantly, the study has taken a regional approach to understanding the social dynamics of this hierarchy instead of generalizing from one observed pattern.

We adopted a similar approach to the study of frontier colonization and settlement spread in the Salt River valley of northeastern Missouri

(Majewski and O'Brien 1984; O'Brien 1984; O'Brien *et al.* 1982). Colonizers of the region, primarily from the bluegrass area of Kentucky, were part of an upper South cultural pattern (Mitchell 1972, 1978) that was based on corn and hog production and on wood-oriented technology. The pattern, which had its roots in the East, emphasized the acquisition of land and slaves as a means of gaining social status, that is, becoming a member of the rural landed gentry. Groups often immigrated as interdependent, inter-related units, and these households had varying degrees of wealth when they arrived in the Salt River valley. Upon arrival, the effects of being able to purchase inexpensive land on household net wealth were twofold: (1) the formerly landless became landowners, creating a substantial middle class (measured in terms of wealth rank), and (2) those who already were wealthy became wealthier. Agricultural and population census schedules, land purchase records, and genealogical records, together with myriad other sources of information, allowed us to monitor the accumulation of wealth over time and for certain time periods to rank families in terms of wealth and social position within the community.

Five of the seven excavated farmsteads were part of what we termed the Smith community, a kin- and affine-based network of upper middle-class families that began in 1819 and by 1840 had grown to sizable proportions through intermarriages (O'Brien 1984). The research design also called for the excavation of upper-class farmsteads in an adjoining settlement cluster, but time and money exigencies precluded this work. The five excavated assemblages, however, allowed us to expand our knowledge of upper middle-class households. None of the five families that occupied the excavated sites owned slaves, though two owned substantial quantities of land (360 and 400 acres).

Ceramic materials were well represented in the assemblages, and the percentage of various decorative classes can be compared to the wealth and status divisions suggested by the archival information. Although analysis is still ongoing, several significant patterns are emerging. The percentages of transfer-printed vessels range from 20 to 28%, the highest percentage occurring in an assemblage from a sealed, pre-1840 context. The highest percentage of shell-edged vessels (14%) also came from the sealed context, as did the highest percentage (26%) of handpainted (nonedge) vessels. Annular-banded wares contribute less than 7% to any assemblage. Of particular interest is the high percentage of bone china (softpaste porcelain), which ranges from a low of 6% to a high of 14% (in the pre-1840 deposit). As at most sites of middle- and low-status families occupied during the nineteenth century (e.g., Otto 1984), hardpaste porcelain occurs rarely (less than 2%). As also noted at other sites, regardless of status, tea services occur in abundance. Identifiable sets of cups and saucers are much more common than sets of plates and often are handpainted bone china or bright polychrome whiteware.

Status and consumer behavior among upper-class and middle-class urban households in the Chesapeake-New England area vis-à-vis ceramic assemblage composition has been the focus of numerous studies (e.g., Cheek and Friedlander n.d.; Cressey *et al.* 1982; Fiester 1975; Garrow 1982; Klein and Garrow 1984; LeeDecker *et al.* n.d.; Teller 1968), including that conducted by Dyson (1982) as part of a long-term archaeological historical project in Middletown, Connecticut. Eight ceramic assemblages were examined, with an emphasis on those portions that dated 1780–1830. Dyson (1982:361) emphasizes that the study shows “some variation in the sites related to social status and occupation, but also many basic similarities related to common behavior patterns. They also show that the ceramics mirror certain general social, economic, and cultural trends of late-eighteenth- and early-nineteenth-century New England.”

Dyson’s work, parts of which are still ongoing, is important because he used a variety of historical documents to monitor changes in social position through time and to correlate those changes with changes in the ceramic assemblages. Because of the depth of the historical documentation, his control over time, and the fact that the sites were distributed over a section of Middletown instead of being in a restricted zone, Dyson also is able to study the changing socioeconomic character of neighborhoods as their occupants made and lost their fortunes in commerce.

An interesting aspect of Dyson’s analysis is his attempt to use ceramic decoration to monitor cognitive variables, such as the changing taste, ideologies, and world views in the individual households. In many respects this part of his analysis runs parallel to many of the currents in Deetz’s (1977) work, in which Deetz searched for bilateral symmetry in household items, architecture, and contemporary ideology (cf. Leone 1982; see also Glassie 1975). Dyson (1982:376–377) traces the evolution of ceramic design from the handpainted, blue-on-white chinoiserie motifs of the mid- and late eighteenth century, which “presented the same air of classic stability as the Greek and Roman motifs used in house architecture” (p. 376), through the later transfer prints that spawned the Blue Willow tradition. By about 1800, “the classic order based on upper-class British values had given way to the twin movements of local patriotism and European Romanticism. The latter reflected considerable nostalgia for the British world, from which the colonists had so recently separated” (p. 376). In the ceramics of the 1820–1830 period, Dyson (1982:377) sees a kind of escapism from the increasingly industrial and commercial world that New England had become. Elegant chinoiserie transfer prints were replaced by pearlware showing country scenes and views of northern Italy. These scenes from the “grand tour” (Hibbert 1969), which previously had been restricted mainly to expensive items, became commonplace designs on a wide range of affordable vessels.

The "basic similarities [in ceramic assemblages] related to common behavior patterns" (p. 361) found by Dyson crosscut several lines of occupation, including merchants and craftsmen, and demonstrate a certain amount of social cohesion among the upper class from the time of the Revolutionary War until about 1820 to 1830. The cohesion is evident in other aspects as well, such as similarities in house plan. Dyson's future analysis of materials from after this period is awaited eagerly.

CONCLUDING REMARKS

Forays into the archaeology of nineteenth-century North America have increased dramatically in number since the early 1970s, partially as a result of the advent of cultural resource management. With this increase has come an attendant rise in interest in ceramic items of the period, as archaeologists broadened their analytical scopes to employ ceramics in their studies of human behavior. In this paper we have focused on the grouping and classification of nineteenth-century ceramics, the temporal placement of ware groups and decorative classes, and the use and misuse of historical period ceramics in the identification of cultural patterning and the examination of human behavior.

At the heart of modern archaeology is the search for and identification of behavioral patterns. Content-based pattern recognition studies in historical archaeology have increased significantly in number over the past 15 yr, as archaeologists continue attempts to construct generalizations about behavior. Early attempts fell short of the mark because of a lack of appropriate consideration of the conditions imposed on behavior by the social and physical environment. These attempts did, however, set the stage for more rigorous examinations that in most cases drew directly from earlier efforts. Archaeologists now are examining topics such as ethnic behavior and socioeconomic position in ways that were impossible 20 yr ago.

The presence of items such as ceramics in a cultural system is related directly to the factors of availability, perceived versus real need, function, and a host of other sociocultural factors, including the size of the groups composing subsets of the system, their economic position, and perhaps their ethnic affiliation. Thus to understand the roles played by these items in the system, in this case nineteenth- and early twentieth-century North America, a battery of interrelated data sets must be used, including data on the technological and commercial aspects of British and American production and distribution of refined earthenware and porcelain. Concurrently, the behavioral aspects of vessel ownership and use must be taken into account, including patterns of secondary use, recycling and lateral cycling, conservatory practices, and discard.

It is no surprise to archaeologists that pattern recognition studies must incorporate both archaeological materials and documentary information. Neither is it any surprise that this often is easier said than done. Errors in sampling and a fragmentary documentary data base can lead to conclusions that later are invalidated when new data come to light, a situation that leads one to conclude that the correct use of logical inference in archaeology still is in a developmental stage. Nevertheless, significant advances in the use of inference in examining general patterns of behavior have been made in historical archaeology. Well-developed research designs to explore the roles of ethnicity, socioeconomic position, and other variables are being developed at a significant rate, and the great majority of these designs employ ceramic data as an important component.

It is not our purpose in this chapter to dictate specific directions that the analysis of historical period behavior should take. In truth, had this review been written 10 yr ago, we doubt that we would have been able to predict where historical archaeology would be today. We *have* attempted to point out areas that are in need of standardization, such as in the categorization of ceramics. This need became even more pronounced after we sent the first draft of this review to a dozen archaeologists who routinely use nineteenth-century ceramics in their analysis. All provided excellent comments and cleared up errors in our presentation, but it was startling to see the amount of disagreement over matters of ceramic technology, especially beginning and ending dates of various ceramic classes, terminology for whitewares, and how best to employ South's mean ceramic-date formula. What this indicates to us is that historical archaeologists have only begun to explore the technological aspects of nineteenth-century ceramics and that much more needs to be done before we can use these tools to their full potential. Archaeologists should view this as an open area of research: one filled with many potential pitfalls but also with exciting possibilities.

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